SALMON SPAWNING GROUND SURVEYS

IN THE BRISTOL BAY AREA, ALASKA, 2002

By

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INTRODUCTION

Aerial surveys of salmon spawning streams have been conducted in the Bristol Bay area of Alaska (Figure 1) for many years. Surveys provide biologists with information regarding the abundance and distribution of sockeye salmon *Oncorhynchus nerka*, chinook salmon *O. tshawytscha*, chum salmon *O. keta*, pink salmon *O. gorbuscha*, and coho salmon *O. kisutch* escapements. This information is important to fishery managers for several reasons. It supplements data gathered at counting towers on the mainstem rivers, provides data from rivers where counting towers are not utilized, and provides data for time periods and species not covered by counting tower operations. Collected information is used to: (1) evaluate escapement goals and escapement/return relationships, (2) forecast future returns, (3) identify possible management problems relating to escapements, and (4) contribute to strategies designed to alleviate escapement problems. This report summarizes the 2002 salmon spawning ground surveys conducted in the Bristol Bay area.

Naknek/Kvichak District

The Naknek-Kvichak District is comprised of three major rivers: (1) the Kvichak River, issuing from Iliamna Lake and its tributaries, (2) the Alagnak or Branch River flowing from Kukaklek and Nonvianuk Lakes, and (3) the Naknek River emanating from Naknek Lake and its tributaries (Figure 2). All of these systems flow into Kvichak Bay.

Since 1955, Kvichak River sockeye salmon escapements have been estimated using counting towers located on the Kvichak's mainstem, approximately one-quarter mile downstream of Lake Iliamna's outlet. From 1957 to 1976, Alagnak River sockeye escapements were estimated using a counting tower located near the upper extent of tidal influence. Since 1977, all Alagnak sockeye escapements have been estimated using aerial surveys. From 1950 to 1957, sockeye escapements to the Naknek River system were counted using a weir on the mainstem of the river just upstream of the tidal influence. From 1958 to the present, escapements have been estimated using counting towers near the Naknek River 'Rapids' downstream of the outlet of Naknek Lake. Escapements of other salmon species into Naknek-Kvichak District drainages have been estimated using aerial surveys.

Egegik District

Egegik River system contains two major watersheds: (1) the Egegik River, flowing from Becharof Lake and nearby coastal lowlands, and (2) the King Salmon River, issuing from runoff from the Kejulik Mountains and southern portions of Katmai National Park (Figure 3). Both rivers flow into Egegik Bay near the village of Egegik.

From 1952 through 1956, a weir was used in the Egegik River to count sockeye salmon escapements. The weir was located near the bottom of the Egegik River rapids. From

1957 to the present, counting towers, situated between the outlet of Becharof Lake and Egegik Lagoon, have been used to estimate sockeye escapements. Escapements for other salmon species have been estimated using aerial surveys.

Ugashik District

The Ugashik River system is comprised of four major watersheds: (1) the Ugashik River, flowing from Lower Ugashik Lake and nearby coastal lowlands, (2) the Dog Salmon River, emanating from glacial melt and runoff from peaks in the Aleutian Range, (3) the King Salmon River, issuing from Mother Goose Lake and three major runoff tributaries, and (4) Dago Creek, issuing from a large lowland coastal area (Figure 4). All of these systems flow into the intertidal reaches of Ugashik River and Ugashik Bay.

From 1949 to 1956, a weir located downstream from the outlet of Lower Ugashik Lake was used to count sockeye salmon escapements. From 1957 to the present, sockeye escapements have been estimated using counting towers located between the outlet of Lower Ugashik Lake and Ugashik Lagoon. Escapements for other salmon species have been estimated using aerial surveys.

Nushagak District

The Nushagak watershed is comprised of four major rivers: (1) the Wood River, draining Grant, Kulik, Beverley, Nerka, and Aleknagik Lakes, (2) the Nushagak River, draining Tikchik Lakes and the Nuyakuk, upper Nushagak, and Mulchatna Rivers, (3) the Igushik River, draining Ualik and Amanka Lakes, and (4) the Snake River, draining Lake Nunavaugaluk (Figures 5 through 8). All of these systems empty into Nushagak Bay.

Abundance and age composition of sockeye salmon escapements in the Wood River Lake system has been estimated annually from counting towers at the outlet of Lake Aleknagik since 1953.

Sockeye salmon distribution in the Wood River Lake system is an important element in establishing escapement goals and measuring success in achieving escapement goals for this system. Interconnecting rivers between the large lakes in the system are primarily used by three-ocean sockeye for spawning, while the lake beaches and tributary streams are used more by two-ocean sockeye. Knowledge of the age composition of returning sockeye gives managers the ability to use a variable escapement goal policy to minimize overcrowding of spawners in the interconnecting rivers while taking advantage of the extensive beach spawning areas and numerous tributary streams.

Periodically, ADF&G personnel conduct aerial surveys to assess sockeye spawner distribution within the Wood River Lake system. Personnel from the University of Washington, Fisheries Research Institute also conducted ground surveys on major creeks and some rivers of the system. Surveys of the actual spawning distribution within the

creeks, rivers, and beaches of the system provide a measure of management success in obtaining the desired spawning distribution.

Salmon escapement in the Nushagak River is estimated by a sonar project, located on the Nushagak River below Portage Creek, approximately 32 km (20 miles) upstream from the river mouth. The Nushagak River sonar project has been used since 1980 to estimate annual escapements for all salmon species in the entire Nushagak drainage (Miller 1997). Prior to the advent of the sonar project, sockeye escapement was estimated by a counting tower project on the Nuyakuk River (1959-1988). Aerial surveys of the Nushagak-Mulchatna system were conducted annually beginning in 1966. Initial surveys provided escapement estimates for chinook and chum salmon, and surveys in the Nushagak and Mulchatna systems since 1977 were used to estimate sockeye abundance in that system. Together, the combined estimates from counting towers and aerial surveys were used by fishery managers as estimates of the Nushagak River drainage sockeye escapement.

ADF&G staff continued to survey the upper Nushagak and Mulchatna areas after the development of the sonar project to provide a comparison with sonar estimates and document spawner distribution for all species except coho salmon. Chum salmon surveys were discontinued in the Nushagak District in 1980, and surveys of the Nushagak-Mulchatna Rivers for all other species were discontinued in 1991 due to the success of the sonar project and limited funding. The Nuyakuk tower project was halted after the 1988 season, but was reinitiated for the 1995 season and has been operated since that time. Aerial surveys of the Nushagak and Mulchatna systems have been conducted sporadically since 1991 providing infrequent information on spawning sockeye distribution in the Nushagak River.

Aerial surveys were conducted sporadically in the Tikchik Lakes system from 1954 to 1987 to assess spawner distribution of sockeye salmon. Surveys of the Tikchik Lakes were conducted infrequently since 1990 to document an apparent change in spawner distribution, evidenced by changes observed in the age composition of Nushagak River sockeye escapement, and supported by reports of low numbers of spawners in the Tikchik Lake system. These surveys have documented lower than expected numbers of spawners in the Tikchik Lakes system, based on sonar estimates in the lower Nushagak River and historical distribution patterns (Browning et. al. 1998). However, few corresponding surveys were conducted in the Nushagak and Mulchatna drainages to completely assess distribution.

Sockeye escapement is measured in the Igushik Lakes system at a counting tower located at the outlet of Amanka Lake. Spawner distribution has not been documented annually, and surveys have not been conducted on the Igushik system for sockeye salmon and other species since 1991 (Russell, et. al. 1992). Spawning escapement and distribution of sockeye salmon in the Snake Lake system was estimated annually prior to 1998 by aerial surveys, but with the closure of the Snake River section and funding shortages in recent years, these surveys have not been continued.

Togiak District

Two major river drainages flow into the Togiak District: (1) the Togiak River, draining Togiak, Gechiak, Pungokepuk, and Ongivinuk Lakes and Nayorurun and Kemuk Rivers (Figure 9), and (2) the Kulukak River, draining Kulukak Lake (Figure 10). Various smaller systems within the district include the Kanik River draining Tithe Creek Ponds and the Quigmy, Matogak, Osviak, Slug, Negukthlik, and Ungalikthluk Rivers. Kulukak River and the Kanik River flow into Kulukak Bay, located in the eastern portion of the district. The Togiak and Quigmy Rivers flow into Togiak Bay, located in the middle of the district, and the Matogak, Osviak, and Slug Rivers flow into Hagemeister Straits and coastal waters in the western portion of the district (Figure 1).

Sockeye salmon escapement is estimated for the Togiak Lake system from counting towers operated at the outlet of Togiak Lake. Abundance and distribution of spawning populations of sockeye salmon in the Togiak River and tributaries below the counting towers, as well as other systems within the Togiak District, are estimated by aerial surveys. Abundance and distribution of chinook, chum, pink, and coho salmon spawning in Togiak District watersheds are also estimated entirely from aerial surveys.

Since 1991, the operational budget has not had sufficient funds to conduct spawning ground aerial surveys in the Togiak District. The U.S. Fish and Wildlife Service Togiak National Wildlife Refuge (USFWS/TNWR) has provided funding for aircraft charters for aerial surveys, and has assisted with aerial surveys in the Togiak District to monitor salmon populations within drainages on the refuge.

METHODS

All survey flights were conducted from small fixed-wing, high-wing, wheeled aircraft (Super Cub, Cessna 180, Cessna 185, or Cessna 206) or helicopter (Robinson R-22) chartered from local air charter companies and flown by experienced survey pilots. Alaska Department of Fish and Game (ADF&G) or USFWS biologists familiar with the streams and target species counted salmon. USFWS pilots and aircraft flew several of the surveys in the Togiak National Wildlife Refuge. Counts were made from low altitudes (200 to 400 feet) at air speeds of 50 to 90 mph. Polarized sunglasses and aircraft positioning were used to minimize effects of glare off the water. Surveys were scheduled to coincide as closely as possible to the historic peak of spawning for the target species, taking into account weather, water conditions, and aircraft availability. Peak of spawning was defined as that point when the greatest number of spawning salmon are occupying redds. Counts were registered on a hand tally counter or on a tape player. This information was transferred to survey data forms either sometime during the survey or upon returning to the office.

Aerial surveys account for only a portion of the known spawning populations (Evzerof, 1975; Nielson and Green, 1981; Rogers, 1984). At the time of each survey, some of the

salmon have yet to reach the spawning grounds, some have already spawned and died, some are still schooled, and some are either misidentified or not seen. Methods used to interpret aerial survey counts are described below for each commercial fishing district.

Naknek/Kvichak District

Aerial surveys were flown during late summer and fall to assess escapements of sockeye, chinook and chum salmon in portions of the Naknek/Kvichak District. Salmon counts for these drainages are indices of the total number of each species present in the spawning area at the time of the survey. In the Alagnak drainage two surveys were flown, August 2 and August 22, providing estimates of sockeye, chinook, chum and pink salmon escapements. Additionally, all major chinook-spawning areas in the Naknek River Drainage were surveyed on July 31, August 2, and August 28; for the Kvichak River, no survey was flown. Within the Naknek Lake drainage, sockeye surveys were flown for spawning distribution. Survey counts were not expanded to provide instantaneous population estimates, although expansions have been made in some earlier years based on subjective criteria. Counting towers were used to estimate total sockeye escapement to the Kvichak and Naknek Rivers. The ADF&G, Commercial Fisheries Division staff made all aerial survey counts in the district.

Egegik District

No system-wide aerial surveys were flown for sockeye salmon in 2002. An aerial survey of known chinook and chum salmon spawning areas in both the Egegik and King Salmon Rivers was flown on July 29. With funding provided by the U.S Fish and Wildlife Service (USFWS), an aerial survey was flown on September 21 to estimate coho salmon escapement. All aerial survey counts in the Egegik drainage are the actual numbers of salmon sighted and should be considered a minimum indication of abundance.

Ugashik District

Salmon counts in the Ugashik District reflect only the actual numbers of salmon sighted on the spawning grounds for 2002. Aerial surveys of known chinook and chum salmon spawning areas in the Ugashik drainage were flown on August 4. With funding provided by the Alaska Department of Fish and Game, an aerial survey was flown on September 22 to estimate coho salmon escapement. Aerial survey counts should be considered a minimum indication of abundance. Additionally, a USFWS project continued the state's tower project for the purpose of counting coho salmon escapement into the Ugashik Lakes.

Nushagak District

No spawning ground surveys were flown in the Nushagak District during the 2002 season.

Togiak District

Survey and data analysis methods used in the Togiak District were similar to those described by Nelson (1979), Bucher (1981), and Russell, et. al. (1990). This year surveys were flown on July 29, 30, 31, August 2, 6, 13, 23, 25, 27, September 3, and October 8 and 9 (Tables 11-14). ADF&G staff surveyed the Togiak and Kulukak River drainages for sockeye, chinook, and chum salmon. USFWS/TNWR staff conducted surveys of the Quigmy, Negukthlik, Slug, Osviak, Matogak and Ungalikthluk Rivers for sockeye, chinook, coho, and chum salmon. The Negukthlik, Togiak and Kulukak systems were not surveyed for coho salmon because of high water conditions.

Total escapement was estimated for sockeye salmon in systems without counting towers (i.e. Kulukak River, main-stem and tributaries of the Togiak River below the towers) by multiplying peak aerial counts by an expansion factor between 1.5 and 3.0 depending on survey and water conditions (Table 11 lists expansion factors by stream). Since 1980, total escapement for chinook salmon in the Togiak District has been calculated by aerial counts using a multiplier of 2.5 if the survey was timed properly relative to the spawning peak and visibility conditions were average. In 2002 an expansion factor of 2.0 to 3.0 was used for chinook surveys depending on the system surveyed. The expansion factor for chum salmon varied between 2.0 and 2.5, with the 2.5 factor applied only to sections of the Togiak River mainstem. An expansion factor of 3.0 has been used for coho salmon in all areas of the Togiak District since the initiation of coho surveys in 1980. Expansion factors have been subjectively adjusted based on weather conditions, visibility, and survey timing with respect to the peak spawning activity.

RESULTS AND DISCUSSION

Naknek/Kvichak District

An aerial survey of sockeye salmon escapement into the Alagnak River and its tributaries was conducted on August 22. The sockeye salmon escapement index count totaled 282,100 for all but Nanuktuk River, which was murky due to recent rains (Table 1). The escapement estimate minus Nanuktuk is still above the 1955-2001 average aerial count of 237,260 (Appendix Table 1), and above the index goal of 185,000 sockeye.

Aerial surveys of chinook salmon escapements into the Naknek River drainage were flown on July 31 (Pauls Creek and King Salmon Creek) August 2 (Big Creek) and August 28 (Naknek mainstem). A total of 7,263 chinook were observed in the Naknek drainage. Over the period from 1971-2001 there have been 23 years in which chinook salmon escapement indices have been obtained from all four main spawning areas

(Appendix Tables 2-6). The chinook escapement index for these 22 years has ranged from a low of 2,691 in 1992 to a high of 11,730 in 1988.

Alagnak River drainage chinook salmon escapement was surveyed on August 2, estimating a total of 3,765 (Table 2). From 1970-2001, Alagnak chinook salmon counts have ranged from a low of 824 in 1973 to a high of 15,210 in 1997 (Appendix Table 7). There were no aerial surveys conducted on the Kvichak River for chinook salmon in 2002 (Appendix Tables 8 and 9).

Chum salmon were counted only during the July 31, King Salmon Creek, and August 2, Alagnak and Big Creek survey. Alagnak River has been the principle chum salmon producing system in the Naknek/Kvichak District (Appendix Table 10). A total of 157,800 chum salmon were observed during the survey.

Egegik District

The 2002 Egegik River sockeye escapement past the counting towers totaled 1,036,092 fish, or 6% below the midrange objective of 1.1 million. The BEG range for Becharof Lake is 800 thousand to 1.4 million. Aerial survey counts of known chinook salmon spawning areas in the Egegik drainage yielded a total count of 912 chinook salmon. No additional chinook salmon were counted at the Egegik River counting towers (Table 3). This total was 19% below the average count of 1,100 (Appendix Table 14), but it was the largest count in four years. The commercial chinook harvest in the Egegik District totaled approximately 276 fish, or 86% below the 1982 to 2001 average harvest of 2,030. Since 1998, fishing time has been reduced to three days per week between June 1 and June 16. Using gillnets with larger than five and one half inch mesh in the commercial fishery from June 1 to July 1 has also been prohibited. Also, fishing time during the sockeye season has been reduced in recent years. All of these factors probably contributed to the reduced commercial harvest of chinook salmon, but in general, recent chinook salmon runs to Egegik have been small. Given the catch and escapement figures above, the Egegik chinook salmon removal rate for 2002 was likely less than 23%.

The chum salmon escapement index was 757 fish (Table 4). The 2002 index was well below the 1982-2001 average of 7,564 fish (Appendix Table 15). The 2002 commercial chum harvest from the Egegik District totaled approximately 22,500 fish, or 77% below the 1982 to 2001 average catch of 98,000. Escapement indices of less than 10,000 chum salmon have been recorded since 1989, but aerial surveys for chum salmon are not reliable indicators and it is believed that chum escapement indices documented over the last several years have probably greatly underestimated chum salmon escapements (Browning et.al. 1998). In 1999, comparing the Gertrude Creek Weir count of 16,000 and an aerial survey count on August 6 showed that the aerial count was only about 2% of the weir count.

No pink salmon were noted during the July 29 aerial survey. One pink salmon was reported from the commercial catch. The 1974 to 2002 pink salmon escapement indices are listed in Appendix Table 16.

The coho salmon escapement was documented with an aerial survey conducted on September 21 (Table 5). The U.S. Fish and Wildlife Service in King Salmon provided funding for this survey. A total of 7,050 coho salmon were counted in the Egegik River and in several tributaries of Becharof Lake. Fifty-four percent of this total was counted in the Egegik River. The aerial counts were focused on main coho salmon producing areas, which are listed in Table 5. Compared to the last six years, the 2002 index count of 7,050 was about 56% above average. The commercial harvest totaled approximately 7,500 fish, which was 81% below the 20-year (1982-2001) average of 37,700. Deliveries occurred through August 15, though the fishery remained open until September 30. Historical survey counts are listed in Appendix Table 17.

Ugashik District

The 2002 Ugashik sockeye salmon escapement tower count was approximately 892,000 fish, or 5% over the midrange objective of 850,000. However, counts observed by a Federal project that continued counting salmon from July 26 through September, may add 21,000 sockeye salmon to the escapement. No system-wide aerial surveys were conducted due to a lack of funding; however, during a chinook and chum salmon survey on August 5 an additional 2,020, and 11,460 sockeye salmon were counted in the Dog Salmon and King Salmon Rivers, respectively, (Table 6).

Chinook salmon escapement surveys of Dog Salmon, King Salmon, and Ugashik Rivers were flown on August 4, and yielded a count of 3,527 fish. Additionally, 108 chinook salmon were counted past the counting towers bringing the cumulative escapement count to about 3,635 (Table 7). The Federal tower project estimated approximately 132 chinook salmon past the counting towers. The Figure Eight Creek count of 986 was the largest escapement component for the system. The 2002 escapement count was 16% below the 1980 to 2001 average count of 4,339 chinook salmon (Appendix Table 18), but it was the fourth largest count in eight years. The Ugashik District's commercial catch of approximately 738 chinook salmon was 75% below the 20-year average harvest of 2,900 and about 54% below the recent 10-year average of 1,600.

An aerial survey of Dog Salmon, King Salmon, and Ugashik Rivers on August 4, yielded a count of 21,700 chum salmon (Table 8). The survey was considered to be near the peak of spawning though a fair number of chum carcasses were observed. The 2002 aerial count was 28% below the 1980 to 2001 average of 30,200 (Appendix Table 19). The District's commercial chum salmon harvest of approximately 36,800 fish was half the 20-year average of 75,000.

The Ugashik pink salmon returns have historically been very small. There was one fish reported from the commercial harvest this year, and 24 pink salmon were counted past the Ugashik counting towers through July 25. An additional 690 pink salmon were estimate from federal escapement counts through September (Appendix Table 20).

An aerial survey for coho salmon was again made this year in the Ugashik drainage and results are listed in Table 9. A total of 3,805 coho salmon were observed on the September 22 flight. Most of the count came from the Lower Ugashik Lake. It is likely that the timing of this survey was too early; especially for Painter Creek, subsequently no survey was flown there this year. Some coho schools were observed in the King Salmon River. For the Ugashik Lakes, a count of 2,255 was 25% below the average count of 3,015. Approximately 21,000 coho salmon were estimated from a federal tower project. The coho harvest of approximately 460 fish was 96% below the recent 10-year average of 10,900. Historical coho salmon escapement data are recorded in Appendix Table 21.

Nushagak District

There were no spawning ground surveys flown this year, for any species. The sonar project at Portage Creek produced apportioned estimates of 87,141 chinook salmon, 315,681 sockeye salmon, 42,343 coho salmon, 317,661 pink salmon, and 419,964 chum salmon in the Nushagak River for 2002. A counting tower was operated on the Nuyakuk River again this year; 68,938 sockeye salmon were counted past this.

Spawning escapement of sockeye salmon in the Wood River system was estimated, by tower count, to be 1.28 million fish, and the Igushik River tower count was 123,156 sockeye below the 150,000 lower end of the BEG. Two-ocean sockeye comprised approximately 83% of the Wood River escapement while three-ocean sockeye contributed the other 17% of the escapement.

Togiak District

Peak aerial counts and total population estimates were derived from aerial surveys for sockeye salmon in major river systems of the Togiak District in 2002 (Table11). The expanded aerial survey estimate, for the Togiak River and its tributaries, was 16,175 sockeye salmon; an additional 162,402 sockeye were counted past the towers just below Togiak Lake. The 1982-2001 average count for the Togiak River and Tributaries is 25,100 fish (Appendix Table 24). The spawning escapement of sockeye salmon in the Kulukak Section, including Kulukak River, Kulukak Lake, and Tithe Creek Ponds, was estimated at 8,500 fish, 31% of the 1982-2001 average of 27,850 (Appendix Table 24). Total sockeye salmon escapement for the Togiak District was 199,507 (Table 11). Expansion factors used to convert aerial survey numbers to actual escapement estimates varied on a stream-by-stream basis from 1.5 to 3.0 depending on survey conditions.

The expanded escapement estimate for chinook salmon in the Togiak District was 14,265 fish (Table 12). The aerial peak live count for the Togiak River and tributaries was 96% of the 1982-2001 average, and aerial counts for all chinook systems in the Togiak District combined were 9% above the 20-year average (Appendix Tables 27 and 28). The escapement goal of 10,000 chinook salmon into the Togiak River was barely missed with an expanded spawning estimate of 9,515 fish (Table 12). Peak aerial counts for chinook salmon and historical counts are available in Appendix Table 28. The Kulukak River

escapement estimate (860 chinook) was good and exceeded the 1982-2001 average count by 21%.

Chum salmon counts were conducted coincidentally with the chinook salmon surveys. The chum salmon return to the Togiak district was good and only the Slug River count was far below the 20-year average escapement. The Togiak River count was approximately 75% of the historical average and in both cases the counts were a little late for peak spawning. All other systems had average to above average escapements. District wide the chum escapement was estimated at 154,360 from a peak aerial survey count of 72,080, which is 94% of the 20-year average count of 76,490 (Table 13, Appendix Tables 29 and 30).

Pink salmon aerial escapement surveys were not flown in 2002. Historical counts (for even years only) may be perused in Appendix Table 23.

Only a few aerial surveys for coho salmon were done in 2002; the lack of a suitable survey plane and poor weather prevented these surveys. Total coho escapement for Togiak River and tributaries was, therefore, not estimated. Surveys were done on the Quigmy, Matogak, Osviak and Slug Rivers as well as the Ungalikthluk River (Table 14). USFWS/TNWR personnel did these surveys. Of the streams that were surveyed, all but the Quigmy had counts that were less than half of the 20-year averages (Appendix Table 32). There was very little commercial harvest of coho salmon reported in 2002, so there is no CPUE information to provide an indication of run strength to the Togiak River.

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Tables

Table 1. Aerial survey counts of sockeye salmon, Alagnak River system, 2002[a]

Location	Number of Fish	Percent of Total
Nonvianuk River	NS	
Nonvianuk Lake	NS	
Kulik River	65,000	23.0
Kulik Lake	9,500	3.4
Alagnak River	NS	
Kukaklek Lake	NS	
Nanuktuk Creek	NC	
Battle River	62,600	22.2
Battle Lake	6,500	2.3
Spectacle Creek	87,300	30.9
Funnel Creek	51,200	18.1
Total	282,100	100.0

[a] Aerial surveys were conducted with fixed-wing aircraft.The notation NS means no survey conducted, NC represents no count, system was flown but to turbid to visually count salmon.

Table 2. Aerial survey counts of chinook, chum, pink, and coho salmon, Naknek-Kvichak District, 2002.

Location	Survey Date	Number of Salmon			
		Chinook	Chum	Pink	Coho
Kvichak River	no survey				
Alagnak River	2-Aug	3,765	157,800	127,500	No survey
Naknek River :					
Paul's Creek	31-Jul	314	No count	No count	No survey
King Salmon Creek	31-Jul	934	3,500	No count	No survey
Big Creek	2-Aug	2,015	23,000	No count	No survey
Mainstem Naknek River	28-Aug	4,240	0	20,000	6,000
Total		11,268	184,300	147,500	6,000

[a] Aerial surveys were conducted with fixed-wing aircraft.

Table 3. Aerial survey peak counts of chinook salmon escapement, Egegik District, 2002.

Location	Survey Date	Number of Chinook Salmon
Egegik River	July 29	0[a]
Shosky Creek	July 29	24
Whale Mountain Creek	July 29	4
Mossy Creek	July 29	0
Mink Creek	July 29	[b]
Gertrude Creek	July 29	277
Kaye's Creek	July 29	220
Takayoto Creek	July 29	149
Angle Creek	July 29	[b]
Contact Creek	July 29	238
Mainstem King Salmon River	July 29	[b]
Total		912

[a] Tower count.

[b] No Count.

Table 4. Aerial survey peak counts of chum salmon escapement, Egegik District, 2002.

Location	Survey Date	Number of Chum Salmon
Egegik River	29-Jul [a]	0[a]
Shosky Creek	29-Jul	[b]
Whale Mountain Creek	29-Jul	284
Mossy Creek	29-Jul	5
Mink Creek	29-Jul	[b]
Gertrude Creek	29-Jul	302
Kaye's Creek	29-Jul	16
Takayoto Creek	29-Jul	0
Angle Creek	29-Jul	[b]
Contact Creek	29-Jul	150
Mainstem King Salmon River	29-Jul	[b]
Total		757

[a] Tower count.

[b] No Count.

Table 5. Aerial survey counts of coho salmon escapement, Egegik District, 2002.

Location	Survey Date	Number of Coho Salmon	Comments
Egegik River Drainage[a]			
Egegik River Rapids	September 21	3,800	Most in the rapids above Myer's Creek
Stream 115.8 (Featherly Creek)	September 21	500	shore
Stream 107.6 (Burl's Creek)	September 21	50	between Featherly Cr.and Burls Cr..
Stream 90.3 (Salmon Creek)	September 21	200	All paired up.
Stream 89.8	September 21	200	No survey too turbid.
Stream 87.0 (Bear Creek)	September 21	200	No survey too turbid.
Stream 73.5 (Becharof Creek)	September 21	550	Up the creek but still in schools.
Stream 48.1 (Kejulik River)	September 21	1,550	poor visibility and was not surveyed.
Total		7,050	

[a] Streams tributary to Becharof Lake are designated by the number of miles between their mouth and the outlet of Becharof Lake (Egegik River) as one travels around the lake in a clockwise fashion from the Becharof lake outlet. This is the same system of designation used for years by previous investigators. Due to logistic problems only one survey was flow this season.

Table 6. Aerial survey peak counts of sockeye salmon escapement, King Salmon and Dog Salmon River, Ugashik District, 2002.

Location	Survey Date	Number of Sockeye Salmon
King Salmon River System:		
Goose Lake and outlet	Aug. 4	160
Needle Lake	Aug. 4	800
Volcano Creek	Aug. 4	[a]
Painter Creek	Aug. 4	10,500
Indecision Creek	Aug. 4	0
Sub-total		11,460
Dog Salmon River System:		
Figure-Eight Creek	Aug. 4	2,000
Goblet Creek	Aug. 4	0
Oldham Creek	Aug. 4	0
Wandering Creek	Aug. 4	20
Mainstem Dog Salmon River	Aug. 4	0
Sub-total		2,020
Total		13,480

[a] No Count.

Table 7. Peak survey counts of chinook salmon escapement, Ugashik District, 2002.

Location	Survey Date	Number of Chinook Salmon
King Salmon River System		
Old Creek	Aug. 4	408
Pumice Creek	Aug. 4	586
Painter Creek	Aug. 4	472
Mainstem King Salmon River	Aug. 4	430
Indecision Creek	Aug. 4	0
Volcano Creek	Aug. 4	[a]
Sub-total		1,896
Dog Salmon River System		
Figure-Eight Creek	Aug. 4	986
Goblet Creek	Aug. 4	74
Oldham Creek	Aug. 4	61
Wandering Creek	Aug. 4	
Mainstem Dog Salmon River	Aug. 4	
Sub-total		1,121
Ugashik River System		
Mainstem Ugashik River	Aug. 7	458 [b]
Grassy Creek	Aug. 7	160
Sub-total		618
Total		3,635

[a] No Count.

[b] Tower and aerial survey count.

Table 8. Peak survey counts of chum salmon escapement, Ugashik District, 2002.

Location	Survey Date	Number of Chum Salmon
King Salmon River System		
Old Creek	Aug. 4	4,200 [a]
Pumice Creek	Aug. 4	5,100 [a]
Painter Creek	Aug. 4	3,100
Mainstem King Salmon River	Aug. 4	8,200
Needle Lake	Aug. 4	0
Indecision Creek	Aug. 4	100
Volcano Creek	Aug. 4	[b]
Sub-total		20,700
Dog Salmon River System		
Figure-Eight Creek	Aug. 4	800
Goblet Creek	Aug. 4	0
Oldham Creek	Aug. 4	0
Wandering Creek	Aug. 4	0
Mainstem Dog Salmon River	Aug. 4	200
Sub-total		1000
Ugashik River System		
Mainstem Ugashik River	Aug. 4	0 [c]
Grassy Creek	Aug. 4	[b]
Sub-total		0
Total		21,700

[a] Includes carcasses.
[b] No Count.
[c] Tower count.

Table 9. Aerial survey counts of coho salmon escapement, Ugashik District, 2002.

Location	Survey Date	Number of Coho Salmon Counted	Comments
	Ugashik Drainage		
Upper Ugashik Lake			
Crooked Creek	September 22	50	Most fish in small schools.
Deer Creek	September 22	0	
Lower Ugashik Lake			
Black Creek to Cabin	September 22	290	Along the shoreline.
Black Creek to Elizabeth Lake	September 22	1,165	All fish seen at mouth and along shoreline.
Ugashik Outlet	September 22	750	
King Salmon River Tributaries			
Pumice Creek	September 22	300	Small schools.
Old Creek	September 22	800	
Painter Creek	September 22		No survey, too early and bad weather.
Dog Salmon River Tributaries			
Figure Eight Creek	September 22	450	
District Total		3,805	

[a] Only one survey was flown.

Table 10. Peak aerial live counts and total escapement estimates of sockeye salmon in the Wood River system, 2002.

Area	Date	Aerial Count	Population Estimate	Distribution %
Wood River				
Lake Aleknagik		**26,121**		
Eagle Creek[a]	8/9/2002	181		
Hansen Creek[a]	8/5/2002	6,961		
Happy Creek[a]	8/5/2002	7,126		
Bear Creek[a]	8/10/2002	2,832		
Yako Creek[a]	8/2/2002	3,232		
Whitefish Creek[a]	8/12/2002	852		
Ice Creek[a]	8/13/2002	3,029		
Mission Creek[a]	8/11/2002	1,908		
Sunshine Creek				
Youth Creek				
Northshore Beaches				
Southshore Beaches				
Yako Beaches				
Agulowok River & lower River Bay				
Lake Nerka		**14,498**		
Fenno Creek[a]	8/10/2002	4,128		
Pike Creek[a]	8/16/2002	1,404		
Stovall Creek[a]	8/24/2002	1,909		
Bear Creek				
Teal Creek[a]	8/23/2002	217		
Pick Creek[a]	8/13/2002	3,005		
Elva Creek[a]	8/23/2002	352		
Kema Creek[a]	8/22/2002	504		
Hidden Lake Creek[a]	8/16/2002	1,795		
Lynx Creek[a]	8/21/2002	813		
Upper River Bay Beaches, NW				
Upper River Bay Beaches, SE				
Allan Cr. - Ross Cr. Beaches				
N6 - River Bay Beach				

(Continued)

Table 10. (page 2 of 3).

Area	Date	Aerial Count	Population Estimate	Distribution %
Pick Creek Beach				
Elva Creek Beach				
Amakuk Arm Beaches				
Amakuk Arm - Ott's Bay Beach				
Ott's Bay Beach				
Anvil Bay Beaches				
Anvil Bay - Elbow Pt. Beach				
Elbow Pt. - Lynx Cr. Beach				
Lynx Cr. - Teal Cr. Beach				
Kema Lake Beaches				
Hidden Lake Beaches	8/19/2002	371		
Lynx Lake Beaches				
Little Togiak River[a]	8/29/2002	**3,541**		
Little Togiak Lake		**592**		
Northshore Beaches	8/11/2002	354		
Southshore Beaches	8/11/2002	238		
D Slough Beaches				
Agulukpak River				
Lake Beverley		**4,186**		
Tsun Creek				
Moose Creek[a]	8/14/2002	4,186		
Hope Creek				
Hardluck Bay Beaches				
Sam's Beach				
Golden Horn Beaches				
Silver Horn Beaches				
B12 & B9 Beaches				
Hope Lake Beach				

(Continued)

Table 10. (page 3 of 3).

Area	Date	Aerial Count	Population Estimate	Distribution %
Peace River				
Lake Mikchalk		**0**		
Narrows				
Northshore Beaches				
Southshore Beaches				
Wind River				
Lake Kulik		**0**		
K1 & K2 Creeks				
K5 Creek - Grant River Beaches				
Grant River - K2 Creek Beaches				
Southshore Beaches				
Grant River	8/23/2002	**2,979**		
Total		51,917	0	0.0%

[a] Ground survey counts conducted by FRI, University of Washington.

[b] No aerial surveys were done in 2002. Information in this table is based soley on stream surveys conducted by FRI personnel. No population estimates or distribution information was calculated.

Table 11. Peak aerial counts of live sockeye salmon and total escapement estimates, Togiak District, 2002.

Stream	Aerial Counts		Total Escapement Estimate	
	Date	Number	Factor [a]	Number
Togiak Section				
Togiak Tower				162,402
Togiak River mainstem	27-Aug	2,050	2.0	4,100
Gechiak Lake System	27-Aug	5,000	1.5	7,500
Pungokepuk Lake	27-Aug	75	1.5	113
Nayororun River	27-Aug	1,525	1.5	2,288
Kemuk River	27-Aug	0	1.5	0
Ongivinuk Lake System	25-Aug	1,450	1.5	2,175
Subtotal		10,100		16,175
Kulukak Section				
Kulukak River	23-Aug	1,750	2.0	3,500
Kulukak Lake	23-Aug	625	2.0	1,250
Tithe Creek Ponds	23-Aug	1,875	2.0	3,750
Subtotal		4,250		8,500
Matogak, Osviak, and Cape Pierce Sections				
Matogak River [b]	30-Jul	1,450	2.5	3,625
Osviak River [b]	30-Jul	1,750	2.5	4,375
Slug River [b]	25-Jul	1,150	2.0	2,300
Subtotal		4,350		10,300
Other				
Quigmy River [b]	30-Jul	660	2.5	1,650
Negukthlik River [b]	31-Jul	160	3.0	480
Ungalikthluk River [b]	31-Jul	0	2.0	0
Subtotal		820		2,130
Total		19,520		199,507

[a] Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

[b] USFWS estimate.

Table 12. Peak aerial counts of live chinook salmon and total escapement estimates, Togiak District, 2002

River		Aerial Counts Date	Aerial Counts Number	Total Escapement Estimates Factor [a]	Total Escapement Estimates Number
Togiak Section					
Togiak River mainstem					
	A	07-Aug	140	2.5	350
	B	07-Aug	410	2.5	1,025
	C	06-Aug	820	3.0	2,460
	D	06-Aug	250	3.0	750
	E	06-Aug	390	3.0	1,170
	F	06-Aug	690	3.0	2,070
	Subtotal		2,700		7,825
Gechiak River		07-Aug	400	2.0	800
Pungokepuk River		06-Aug	45	2.0	90
Nayorurun River		06-Aug	65	2.0	130
Kemuk River		06-Aug	210	2.0	420
Ongivinuk River		06-Aug	125	2.0	250
	Subtotal		845		1,690
	Togiak River Drainage Total		3,545		9,515
Kulukak Section					
Kulukak River		02-Aug	860	2.0	1,720
Matogak, Osviak, and Cape Pierce Sections					
Matogak River[b]		30-Jul	54	2.0	108
Osviak River[b]		30-Jul	62	2.0	124
Slug River[b]		29-Jul	7	2.0	14
	Subtotal		123		246
Other					
Quigmy River[b]		30-Jul	28	2.0	56
Negukthlik River[b]		31-Jul	1,203	2.0	2,406
Ungalikthluk River[b]		31-Jul	161	2.0	322
	Subtotal		1,392		2,784
Total			5,920		14,265

a Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

b USFWS estimate.

Table 13. Peak aerial counts of live chum salmon and total escapement estimates, Togiak District, 2002.

River	Aerial Counts		Total Escapement Estimate	
	Date	Number	Factor [a]	Estimate
Togiak Section				
Togiak River mainstem				
A	07-Aug	3,350	2.5	8,375
B	07-Aug	5,300	2.5	13,250
C	06-Aug	4,200	2.5	10,500
D	06-Aug	800	2.5	2,000
E	06-Aug	4,650	2.5	11,625
F	06-Aug	2,100	2.5	5,250
Subtotal		20,400		51,000
Gechiak River	07-Aug	4,950	2.0	9,900
Pungokepuk River	06-Aug	650	2.0	1,300
Nayorurun River	06-Aug	2,700	2.0	5,400
Kemuk River	06-Aug	1,800	2.0	3,600
Ongivinuk River	06-Aug	650	2.0	1,300
Subtotal		10,750		21,500
Togiak River Drainage Total		31,150		72,500
Kulukak Section				
Kulukak River	02-Aug	15,400	2.0	30,800
Matogak, Osviak, and Cape Pierce Sections				
Matogak River [b]	30-Jul	7,600	2.0	15,200
Osviak River [b]	30-Jul	6,360	2.0	12,720
Slug River [b]	29-Jul	800	2.0	1,600
Subtotal		14,760		29,520
Other				
Quigmy River [b]	30-Jul	3,300	2.0	6,600
Negukthlik River [b]	31-Jul	530	2.0	1,060
Ungalikthluk River [b]	31-Jul	6,940	2.0	13,880
Subtotal		10,770		21,540
Total		72,080		154,360

a Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

b U.S. Fish and Wildlife Service estimate.

Table 14. Peak aerial counts of live coho salmon and total escapement estimates, Togiak District, 2002.

Stream	Aerial Counts		Total Escapement Estimate	
	Date	Number	Factor [a]	Number
Togiak Section				
Togiak River mainstem				
A	No Surveys Done			0
B	No Surveys Done			0
C	No Surveys Done			0
D	No Surveys Done			0
E	No Surveys Done			0
F	No Surveys Done			0
Subtotal		0		0
Gechiak River	No Surveys Done			0
Pungokepuk River	No Surveys Done			0
Nayororun River	No Surveys Done			0
Kemuk River	No Surveys Done			0
Ongivinuk River	No Surveys Done			0
Subtotal		0		0
Togiak River Drainage		0		0
Kulukak Section				
Kulukak River	No Surveys Done			0
Matogak, Osviak, and Cape Pierce Sections				
Matogak River [b]	08-Oct	597	3.0	1,791
Osviak River [b]	08-Oct	539	3.0	1,617
Slug River [bc]	09-Oct	62	3.0	186
Subtotal		1,198		3,594
Other				
Quigmy River [b]	08-Oct	421	3.0	1,263
Negukthlik River	No Surveys Done			
Ungalikthluk River [b]	08-Oct	1,207	3.0	3,621
Subtotal		1,628		4,884
Total		2,826		8,478

[a] Derived by expanding peak live count to reflect fish not counted due to variables such as schooled and dead fish, late or poor survey conditions, bad weather, etc..

[b] U.S.F.W.S. survey.

[c] Survey precluded by muddy water.

Figures

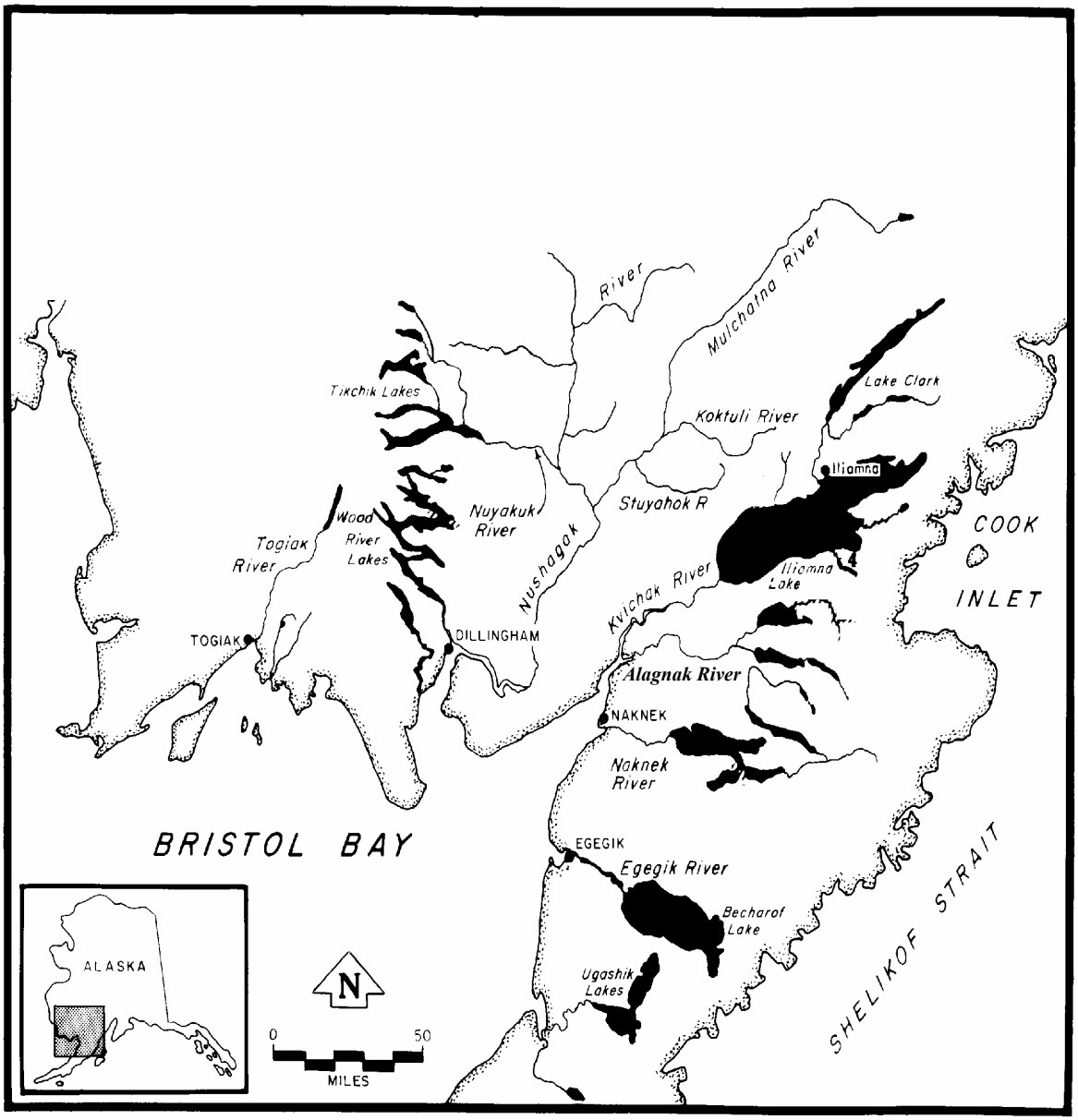

Figure 1. Bristol Bay management area, Alaska.

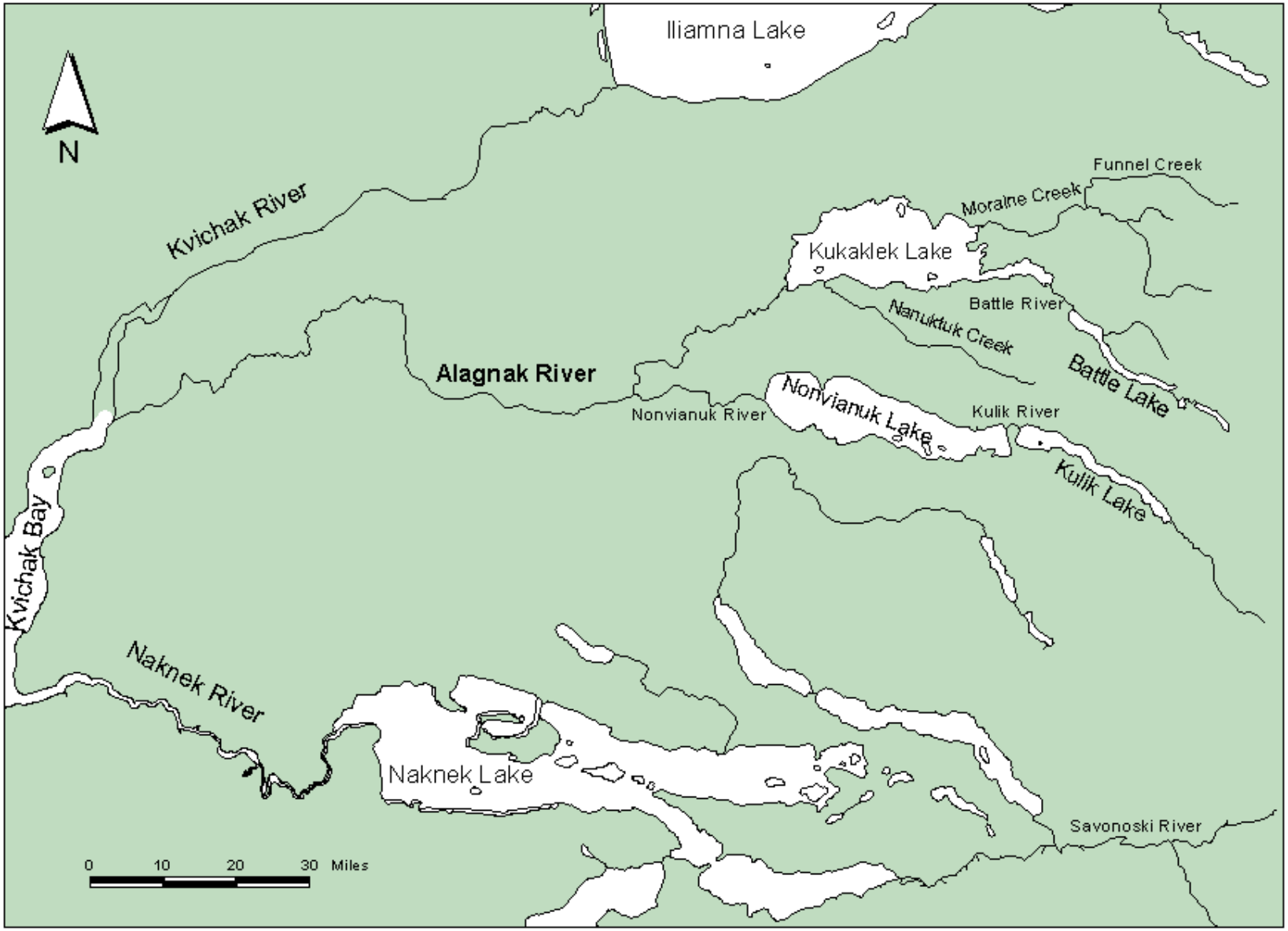

Figure 2. Alagnak River drainage, Bristol Bay, Alaska.

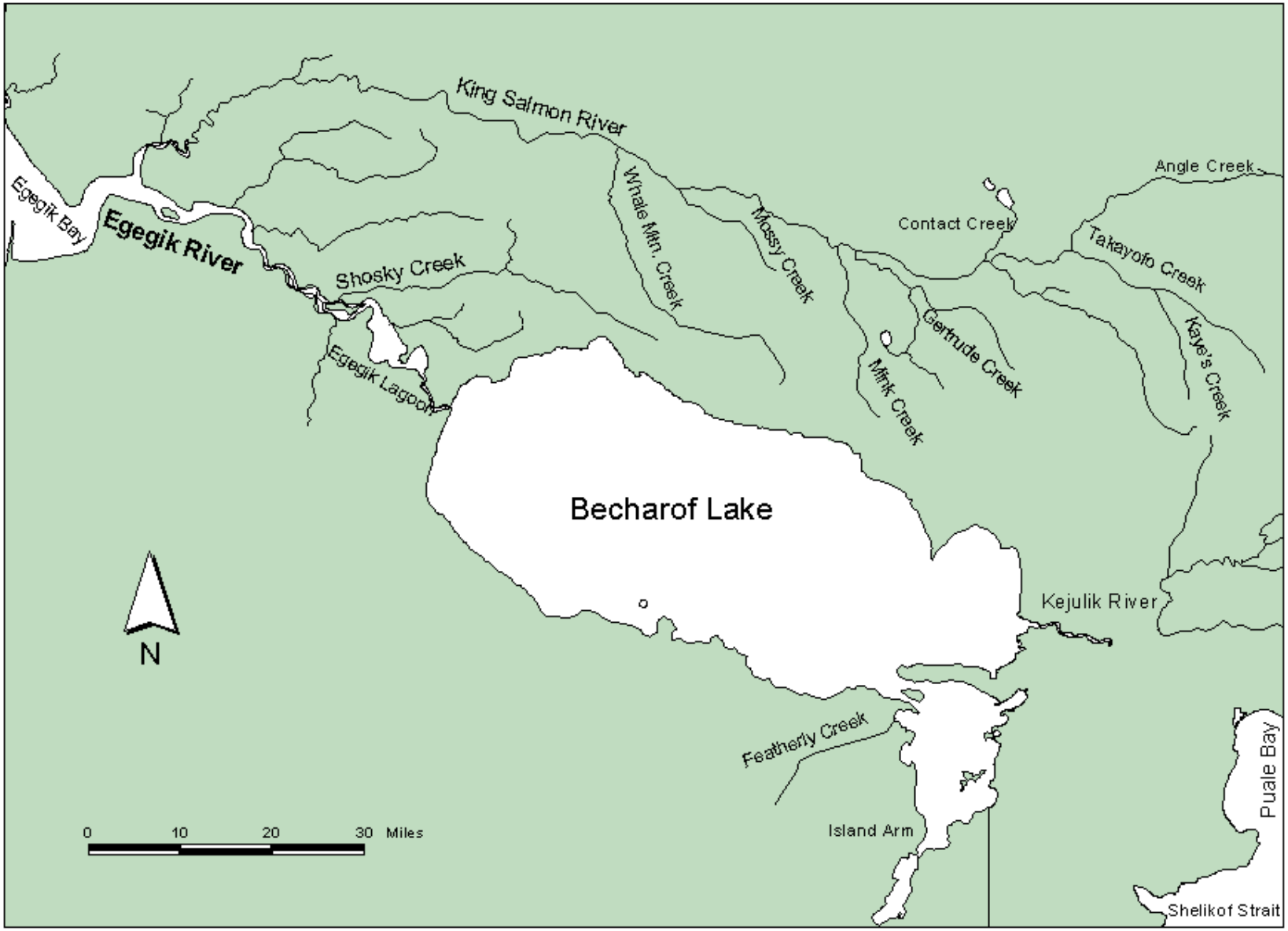

Figure 3. Egegik River drainage, Bristol Bay, Alaska

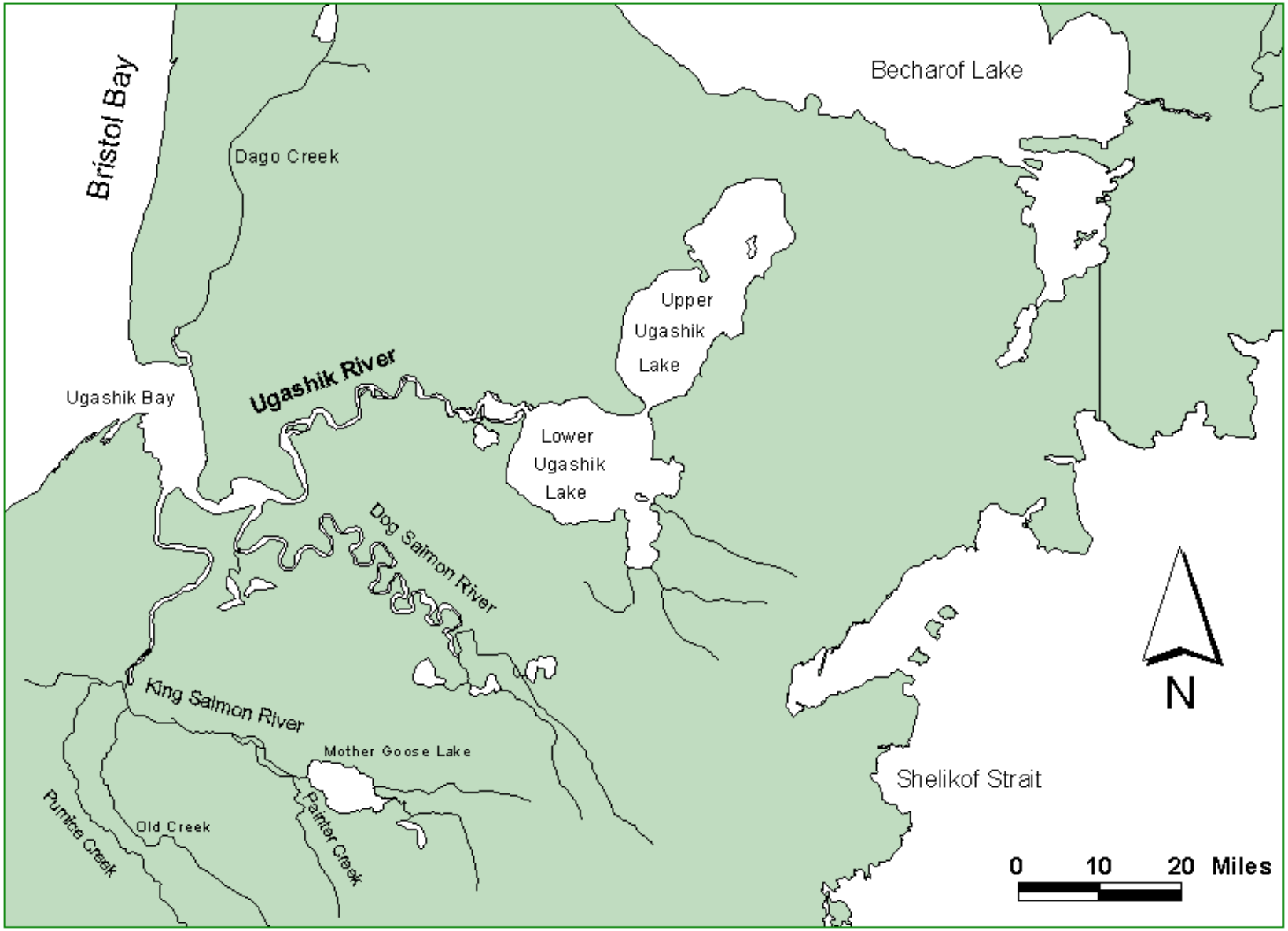

Figure 4. Ugashik River drainage, Bristol Bay, Alaska.

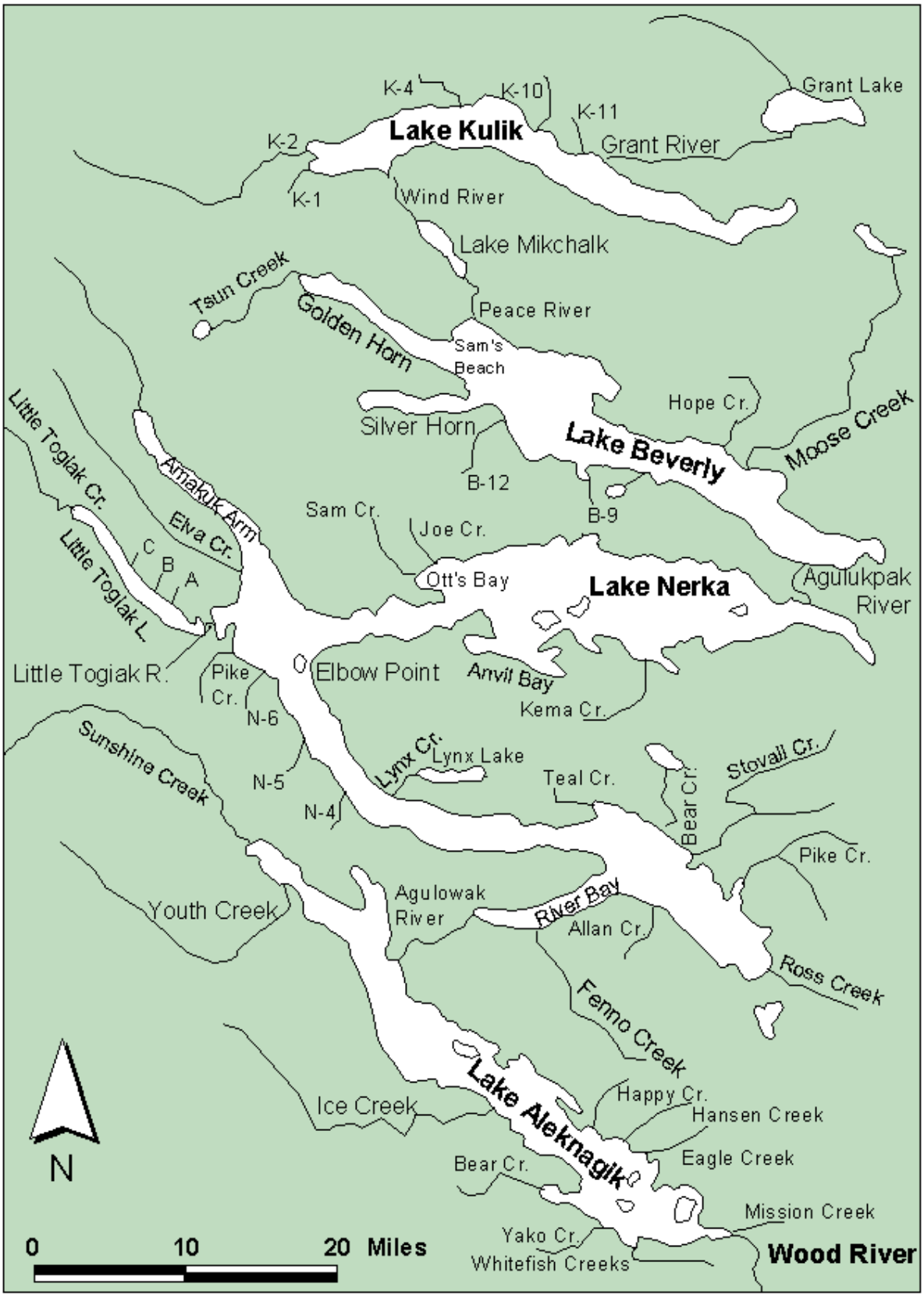

Figure 5. Wood River Lakes system, Bristol Bay, Alaska.

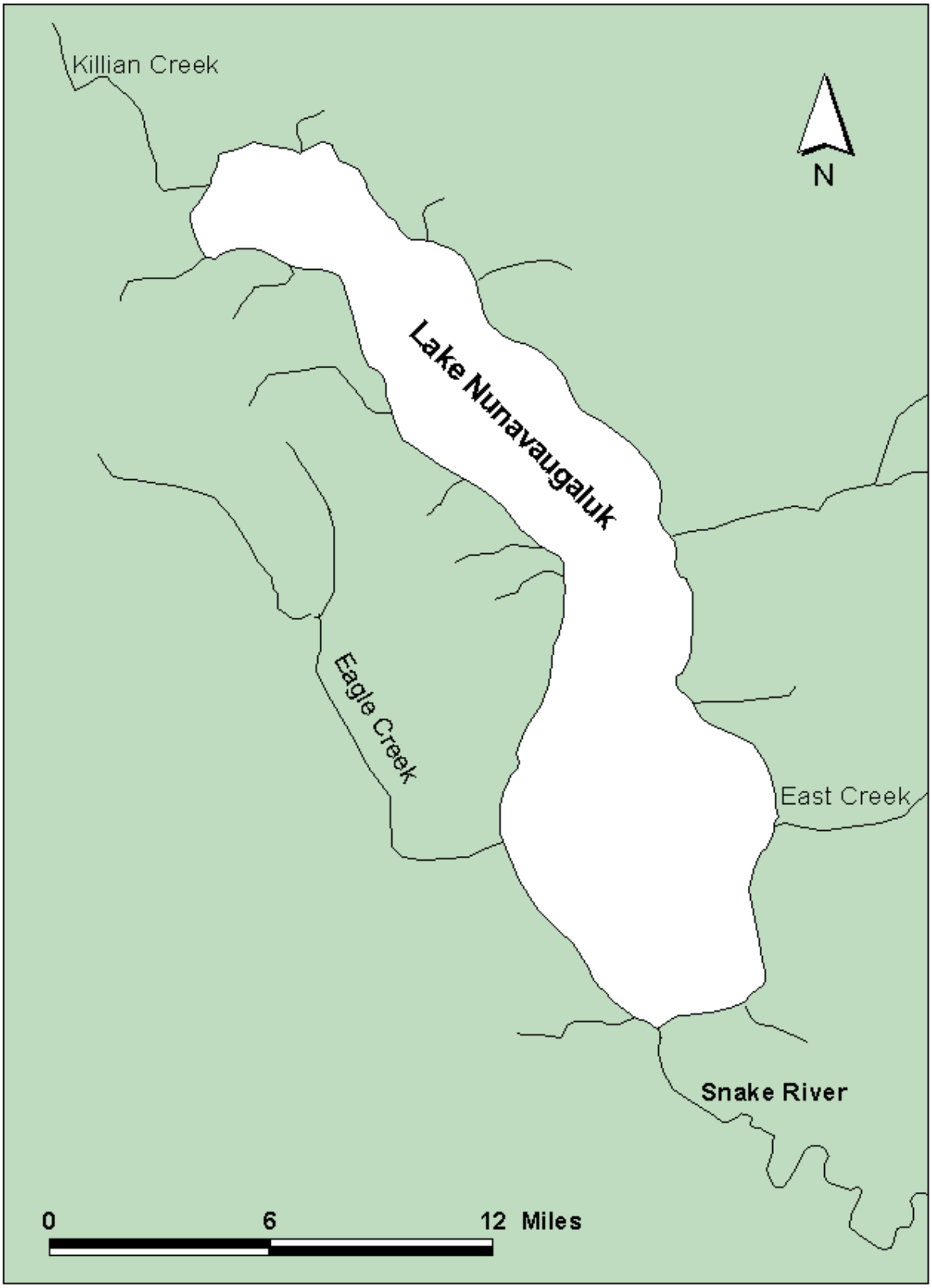

Figure 6. Lake Nunavaugaluk system, Bristol Bay, Alaska.

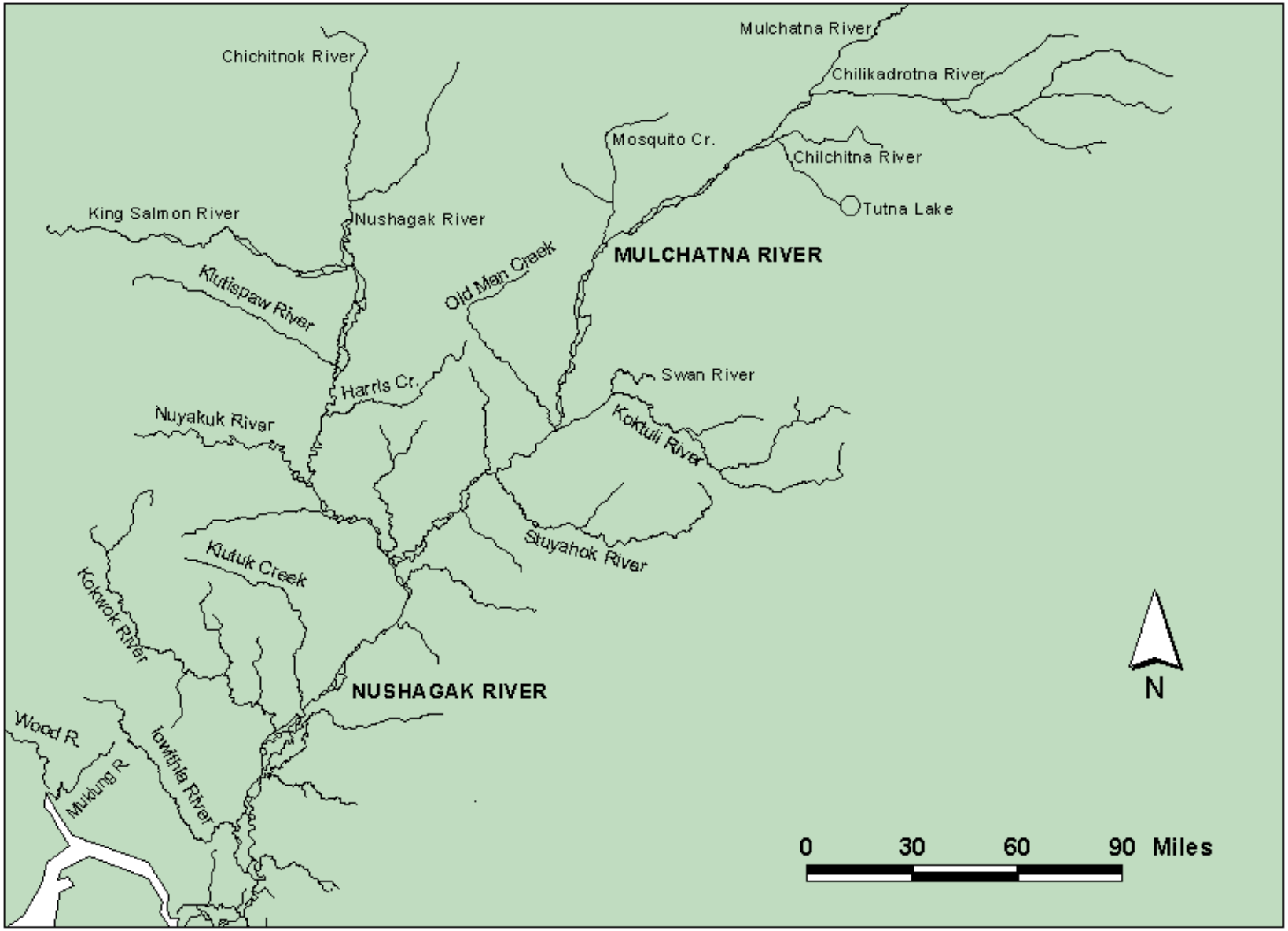

Figure 7. Nushagak-Mulchatna River system, Bristol Bay, Alaska.

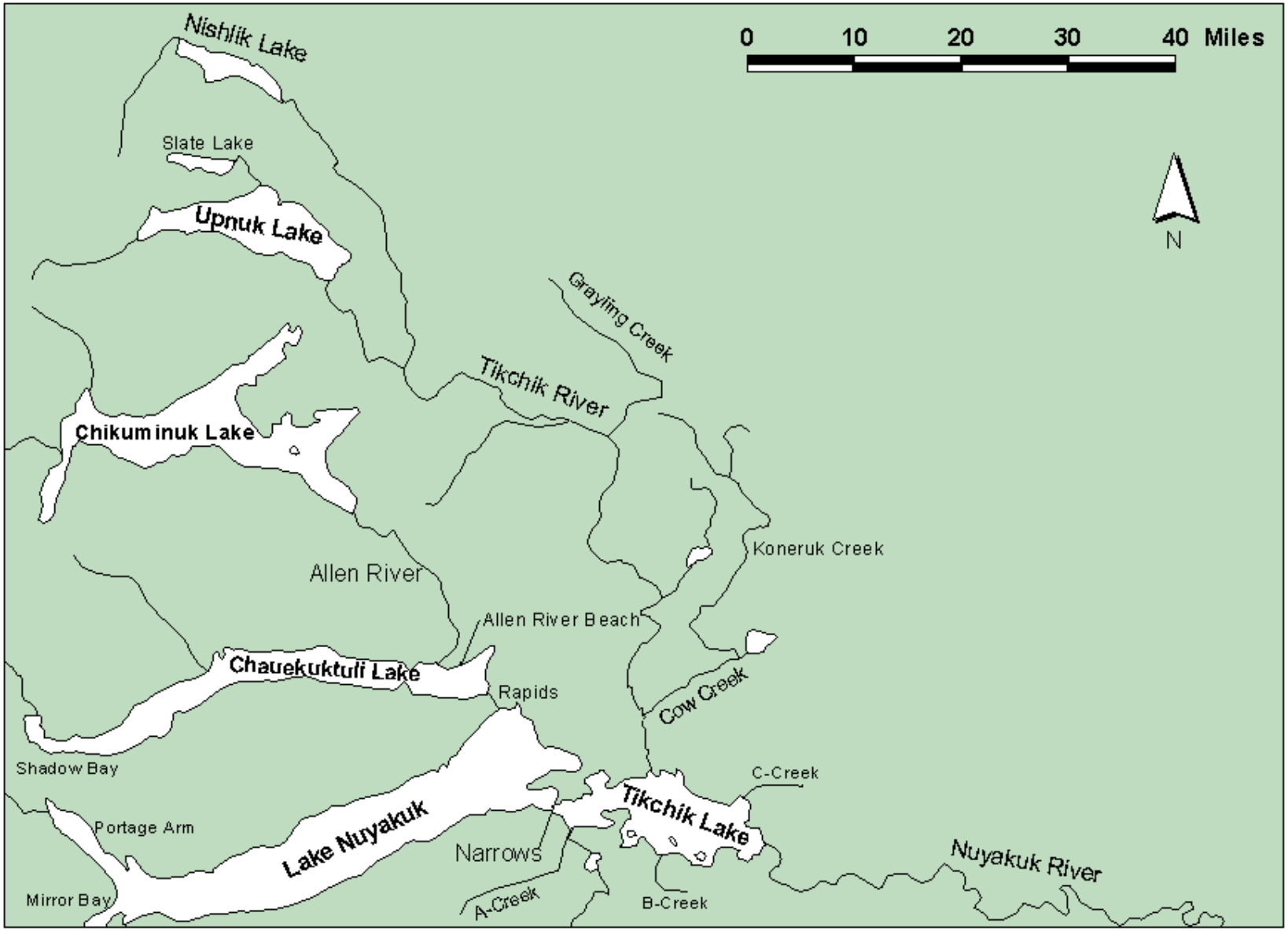

Figure 8. Tikchik Lakes system, Bristol Bay, Alaska.

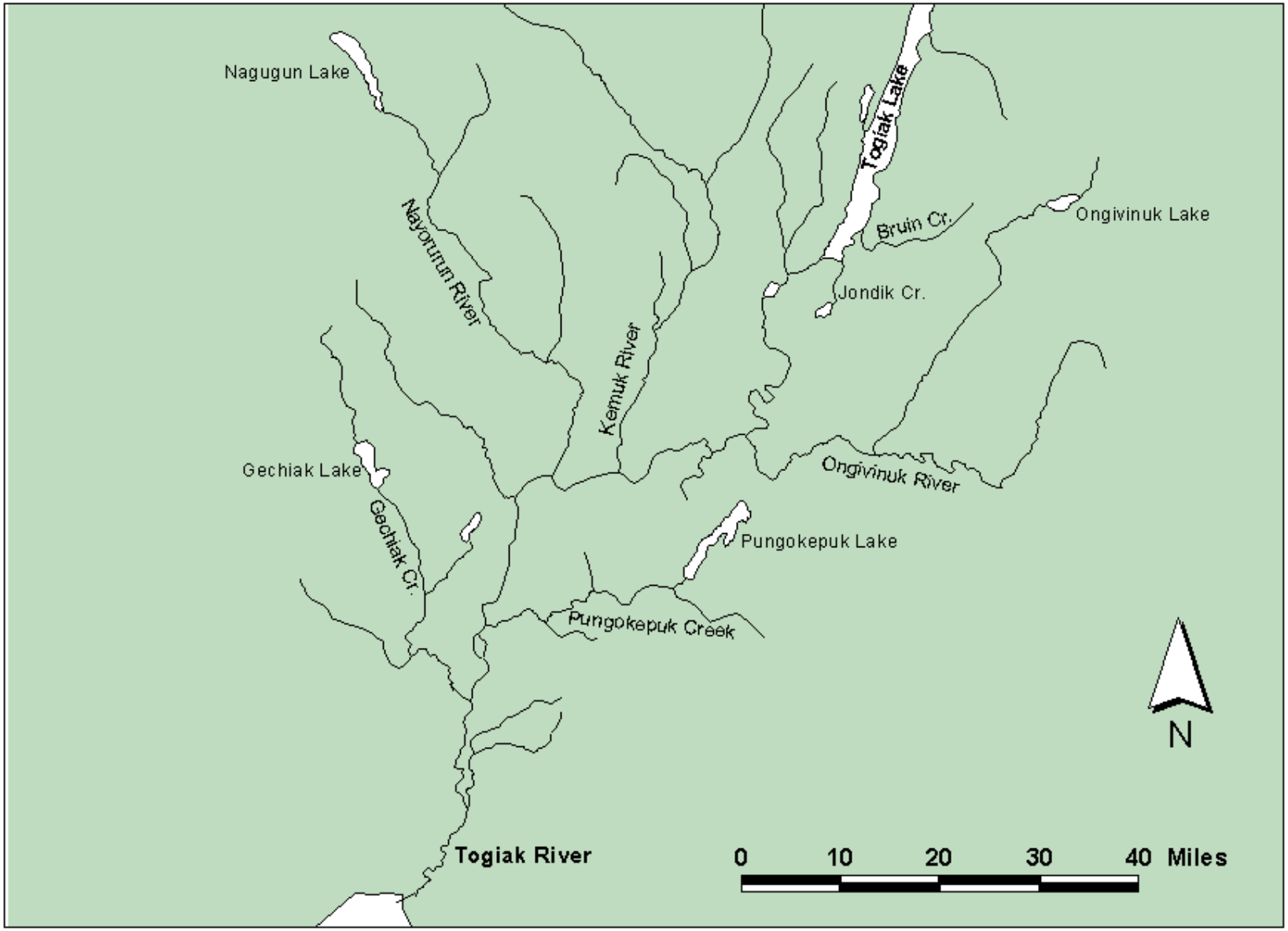

Figure 9. Togiak River system, Bristol Bay, Alaska.

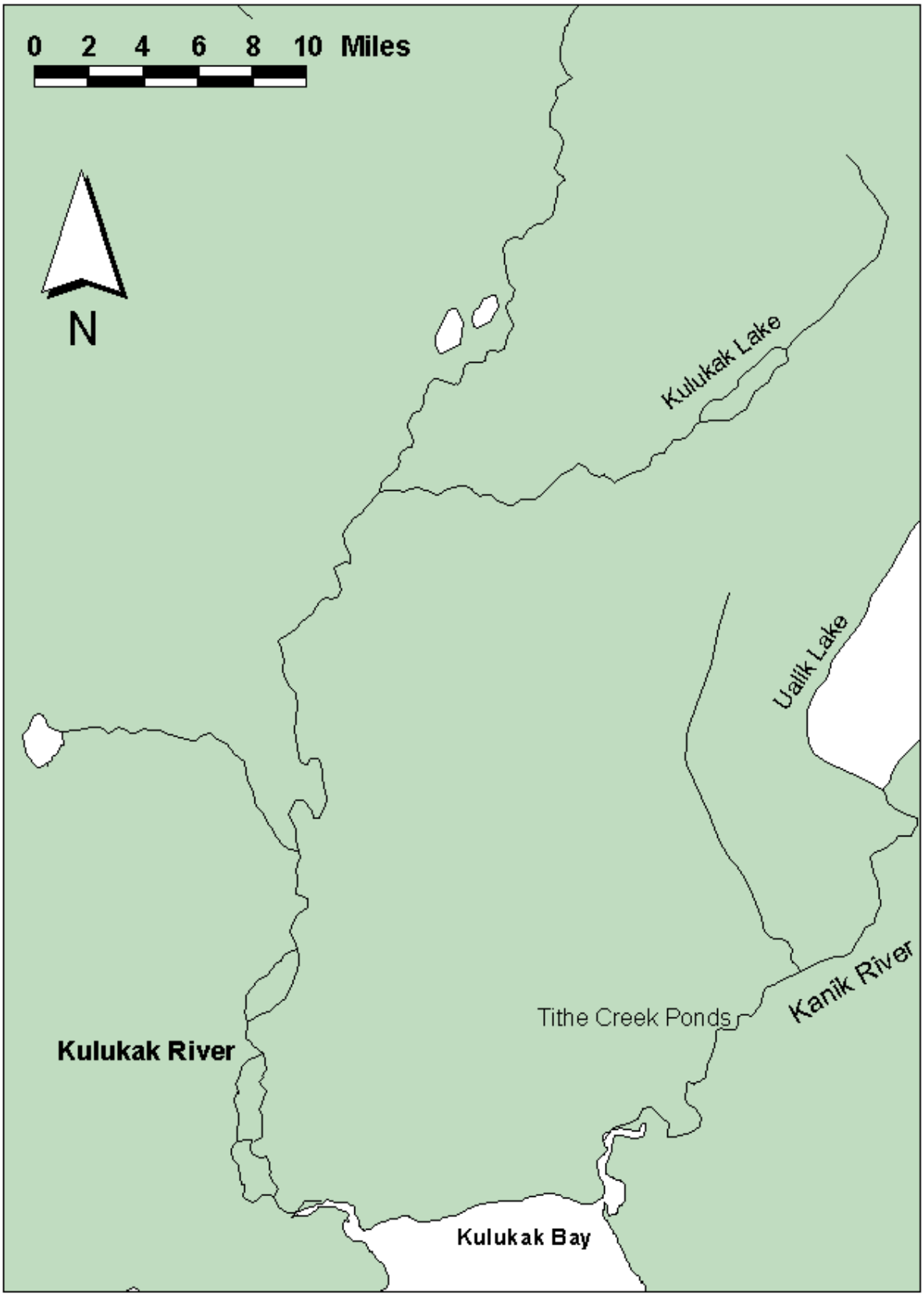

Figure 10. Kulukak River system, Bristol Bay, Alaska.

Appendices

Appendix Table 1. Sockeye salmon total escapement estimates, Naknek-Kvichak District, 1955-2002. Estimates based on visual counts from towers unless otherwise noted.

Year	Kvichak	Naknek	Alagnak	Total	Alagnak Percent of Total
1955	250,546	278,500 [b]	171,500 [a]	700,546	24
1956	9,443,318	1,772,595 [b]	784,000 [a]	11,999,913	7
1957	2,842,810	634,645 [b]	126,595	3,604,050	4
1958	534,785	278,118	94,650	907,553	10
1959	680,000	2,231,807	825,431	3,737,238	22
1960	14,630,000	828,381	1,240,530	16,698,911	7
1961	3,705,849	351,078	90,036	4,146,963	2
1962	2,580,884	723,066	90,630	3,394,580	3
1963	338,760	905,358	203,304	1,447,422	14
1964	957,120	1,349,604	248,700	2,555,424	10
1965	24,325,926	717,798	175,020	25,218,744	1
1966	3,775,184	1,016,445	174,336	4,965,965	4
1967	3,216,208	755,640	202,626	4,174,474	5
1968	2,557,440	1,023,222	193,872	3,774,534	5
1969	8,394,204	1,331,202	122,490	9,847,896	1
1970	13,935,306	732,502	177,060	14,844,868	1
1971	2,387,392	935,754	187,302	3,510,448	5
1972	1,009,962	586,518	151,188	1,747,668	9
1973	226,554	356,676	35,280	618,510	6
1974	4,433,844	1,241,058	214,848	5,889,750	4
1975	13,140,450	2,026,686	100,480	15,267,616	1
1976	1,965,282	1,320,750	81,822	3,367,854	2
1977	1,341,144	1,085,856	100,000 [a]	2,527,000	4
1978	4,149,288	813,378	229,400 [a]	5,192,066	4
1979	11,218,434	925,362	294,200 [a]	12,437,996	2
1980	22,505,268	2,644,698	297,900 [a]	25,447,866	1
1981	1,754,358	1,796,220	82,210 [a]	3,632,788	2
1982	1,134,840	1,155,552	239,300 [a]	2,529,692	9
1983	3,569,982	888,294	96,220 [a]	4,554,496	2
1984	10,490,670	1,242,474	215,370 [a]	11,948,514	2
1985	7,211,046	1,849,938	118,030 [a]	9,179,014	1
1986	1,179,322	1,977,645	230,180 [a]	3,387,147	7
1987	6,065,880	1,061,806	154,210 [a]	7,281,896	2

(Continued)

Appendix Table 1. (page 2 of 2).

Year	Kvichak	Naknek	Alagnak	Total	Alagnak Percent of Total
1988	4,065,216	1,037,862	194,630 [a]	5,297,708	4
1989	8,317,500	1,161,984	196,760 [a]	9,676,244	2
1990	6,970,020	2,092,578	168,760 [a]	9,231,358	2
1991	4,222,788	3,578,508	277,589 [a]	8,078,885	3
1992	4,725,864	1,606,650	226,643 [a]	6,559,157	3
1993	4,025,166	1,535,658	347,975 [a]	5,908,799	6
1994	8,337,840	990,810	242,595 [a]	9,571,245	3
1995	10,038,720	1,111,140	215,713 [a]	11,365,573	2
1996	1,450,578	1,078,098	306,750 [a]	2,835,426	11
1997	1,503,732	1,025,664	218,115 [a]	2,747,511	8
1998	2,296,074	1,202,172	252,200 [a]	3,750,446	7
1999	6,196,914	1,625,364	463,600 [a]	8,285,878	6
2000	1,827,780	1,375,488	451,300 [a]	3,654,568	12
2001	1,095,348	1,830,360	267,000 [a]	3,192,708	8
2002	703,884	1,263,918	282,100 [a]	2,249,902	13
Mean	5,244,364	1,236,560	237,260 [c]	6,728,017	6

[a] Aerial survey counts.

[b] Weir counts.

[c] Mean of counts from 1977 to present.

Appendix Table 2. Aerial survey counts of chinook salmon escapements, Naknek River drainage, 1971-2002.

Year	Mainstem Naknek River	Paul's Creek	King Salmon Creek	Big Creek	Total
1971	1,639	52	704	490	2,885
1972	351	156	1,224	1,060	2,791
1973	1,315		115	1,106	2,536
1974		91	495	860	1,446
1975	2,250	144	279	779	3,452
1976	5,950	31	180	970	7,131
1977	4,830		1,860		6,690
1978					[a]
1979					[a]
1980	300	17		30	347
1981	2,890		591	790	4,271
1982	5,360	340	980	1,930	8,610
1983	2,860	290	460	4,220	7,830
1984	790	400	385	3,420	4,995
1985	590				590
1986	2,200	73	102	1,542	3,917
1987	2,800	7	290	1,353	4,450
1988	7,380	150	600	3,600	11,730
1989	1,700	50	100	860	2,710
1990	4,500	150	350	2,000	7,000
1991	1,655	121	275	2,340	4,391
1992	1,550	88	158	895	2,691
1993	5,520	86	700	1,710	8,016
1994	5,970	203	974	2,531	9,678
1995	2,790	26	239	1,905	4,960
1996	2,965	157	312	1,576	5,010
1997	7,520	248	902	1,783	10,453
1998	2,150	210	1,060	2,085	5,505
1999		223	847	2,250	3,320

(continued)

Appendix Table 2 . (page 2 of 2).

Year	Mainstem Naknek River	Paul's Creek	King Salmon Creek	Big Creek	Total
2000	1,900	43	178	1,112	3,233
2001	3,800	118	413	2,009	6,340
2002	4,240	314	934	2,015	7,503
Mean	3,134	146	561	1,686	5,528 [b]
Percent	57	3	10	31	100

[a] Counts unavailable.

[b] The sum of mean indices.

Appendix Table 3. Chinook salmon escapement survey history, mainstem Naknek River, 1929-2002.

Year	Count Dates	Surveyors	Actual Weir Count [a]	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [b]	Comments
1929	7/03-7/31		1,498			Chinook count peaked 7/27.
1930	6/20-8/09		1,999			Chinook count peaked 8/09.
1931	6/17-8/09		896			Chinook count peaked 8/07.
1932	6/23-8/10		1,869			
1950	7/08-8/20		3,097			Chinook count peaked 8/09.
1951	6/28-8/07		1,876			Chinook count peaked 8/04.
1952	6/25-8/10		633			Chinook count peaked 8/06.
1953	6/24-8/10		2,074			Chinook count peaked 7/26.
1954	6/20-8/11		3,474			Chinook count peaked 8/10.
1955	6/13-8/17		4,188			Chinook count peaked 8/16.
1956	6/22-8/28		7,378			Chinook count peaked 8/18.
1957	6/28-8/04		8,504			Chinook count peaked 8/03.
1966		Redick				300 were counted 8/26 from a skiff in the
1967	Mid-Aug.	Paddock			800	
1968					1,200	Conservative estimate.
1969					1,200	
1970	7/31	Whitehead		845		
	8/03	Siedelman		3,060		Visibility very good. Super-cub.
	8/22	Siedelman		1,540	1,750	Water high & murky. Spawning pre-peak.
	8/22	Whitehead		1,310		
	8/25	Whitehead		2,225		Counting conditions optimal.
	8/25	Siedelman		2,536	2,500	Conditions good. Spawning pre-peak.

(Continued)

Appendix Table 3. (page 2 of 3).

Year	Count Dates	Surveyors	Actual Weir Count [a]	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [b]	Comments
1971	8/26	Cunningham		1,639		Fish concentrated near Rapids Camp. Few
1972	8/23	Cunningham & McCurdy		351		Poor counting conditions. Post-peak.
1973	8/19	Russell		1,315		Counting conditions good. Peak near at
1974	8/19	Russell			450	Count accuracy questionable. Many fish
1975	8/17	Russell		2,250		Good viewing, peak near. Still fish spawning
1976	8/13	Bill		2,615		Spawning near peak. Very few dead.
	8/16	Russell		5,950	7,250	Pre-peak. Still lots fish holding in large
1977	8/22	Russell		4,830	5,750	Pre-peak. Few dead. Some still holding
1978	8/09	Gwartney			4,000	Near peak.
1983	8/14	Bill		2,860	3,000	Pre-peak. Still fish holding in large groups.
1984	8/14	Bill		790	2,370	
1985	8/06	Bill			600	Pre-peak.
	8/27	Bill		590	700	
1986	8/18	Russell		1,990		Spawning pre-peak. Still many fish holding.
	8/19	Meyer		2,200		Peak of spawning drawing near.
1987	8/19	Meyer		2,800		Pre-peak. Fish still in large groups. Few
	8/28	Bill		2,655	2,855	
1988	8/09	Minard		7,380	7,400	Approaching peak. Most fish on redds.
1989	8/14	Minard		1,700		Fish actively spawning. Few carcasses
1990	8/06	Minard		4,500		
1991	8/20	Russell		1,655		Pre-peak. Still many fish schooled &

(Continued)

Appendix Table 3. (page 3 of 3).

Year	Count Dates	Surveyors	Actual Weir Count [a]	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [b]	Comments
1992	8/21	Regnart		877		Water clarity poor in deeper pools.
	8/27	Regnart		1,550		At Peak...all fish on redds.
1993	8/23	Regnart		5,520		Near peak. Still some fish schooled.
1994	8/24	Regnart		5,970		Near peak. Most on redds.
1995	8/21	Regnart		2,790		Near peak. Most on redds.
1996	8/21	Regnart		2,965		At Peak...all fish on redds.
1997	8/16	Regnart		7,520		Near peak. Most on redds.
1998	8/18	Regnart		2,150		At Peak...all fish on redds.
1999	no survey					Survey flown September 8 no count
2000	8/07	Morstad		1,900		Early still fish schooled
2001	8/29	Morstad		3,800		Slightly after peak
2002	8/28	Morstad		4,240		Slightly after peak
Mean			3,124	2,783		

[a] Weir count did not account for estimated 15-20% of chinook that spawn downstream of weir site. Also does not account for fish that migrated upstream past the weir site before and after weir operation.

[b] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 4. Chinook salmon escapement survey history, Big Creek, Naknek River Drainage, 1963-2002.

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1963	8/01	Paddock		362		Covered only half stream length. Helicopter.
	8/13	Paddock		1,345	2,690	Spawning near peak. Good survey.
1964	7/31	Paddock		484		Survey too early.
	8/15	Siedelman & Williamson		636		Survey fair to good. Near peak. Helicopter.
	8/15-	Siedelman & Williamson	1,130			Peak of spawning over.
1965	8/05-8/08	Andrews	578			Fair survey. Began below Index Area No. 1.
1966	8/13-8/16	Redick	979			Spawning at peak. Included Index Area No. 1. Count affected by rain/turbid water in lower areas.
1967	8/10-8/14	Whitehead & Bury	1,129			Upstream redds occupied while those in the lower stream area were abandoned.
1968	8/10-8/14	Meyers & Preyer	3,827			Counting conditions fair to poor.
1969	8/12-8/14	Parkinson & Faro	1,012			High murky waters hampered float count.
	Mid-Aug.	??			5,000	Flown due to poor count conditions during float.
1970	7/19	Whitehead		825		
	8/15-8/17	Parkinson & Brooks	1,601			High murky waters in lower 2/3 of stream.

(Continued)

Appendix Table 4. (page 2 of 3).

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1971	8/13	Cunningham		490	1,200	Only upper 1/3 of stream surveyed due to murky water in lower 2/3.
	8/28	Siedelman		277		Past peak. Survey affected by winds of 30+ mph.
1972	8/08	Cunningham		695		Pre-peak.
	8/18	Siedelman		1,060		Post-peak.
1973	8/17	Russell		1,106		At peak of spawning. Many fish beaten up (fungus).
1974	8/01	Russell		520	850	Pre-peak. No dead chinook. Lots dead chums.
	8/11	Russell		860	1,250	Didn't survey lower 8 miles of creek 8/11. Could add to survey as Russell saw that many in the unsurveyed from skiff 8/10. Near peak.
1975	8/09	Russell		779		Survey pre-peak.
1976	8/13	Bill		970	1,400	Not total stream coverage due to winds & low fuel.
1983	8/14	Bill		4,220	9,000	
1984	8/08	Bill		3,420	8,800	At peak of spawning.
1985	8/06	Bill			2,900	Survey conditions..high water & gusty winds.
1986	8/08	Meyer		1,542	6,000	Excellent conditions. Fish at spawning peak.
1987	8/21	Meyer		1,353	2,500	
1988	8/09	Minard		3,600		
1989	8/14	Minard		860		
1990	8/06	Minard		2,000		
1991	8/12	Regnart		2,340		At spawning peak..all fish on redds, only 20 dead.
1992	8/18	Regnart		895		Est. 5-6 days post-peak. Count includes 125 dead.

(Continued)

Appendix Table 4. (page 3 of 3).

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1993	8/17	Regnart		1,710		Estimated survey 3-4 days past peak.
1994	8/16	Regnart		2,531		Est. 2-3 days post-peak. Count includes 159 dead.
1995	8/15	Regnart		1,905		Estimate survey was several days past peak.
1996	8/12	Regnart		1,576		At spawning peak....38 dead observed
1997	8/7	Regnart		1,783		At spawning peak….48 dead observed
1998	8/18	Regnart		2,085		At spawning peak….no carcasses present
1999		Morstad		2,250		At spawning peak….no carcasses present
2000	8/07	Morstad		1,112		At spawning peak….4 dead observed
2001	8/08	Morstad		2,009		At spawning peak
2002	8/02	Morstad		2,015		At spawning peak
Mean			1,465	1,488		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 5. Chinook salmon escapement survey history, King Salmon Creek, Naknek River drainage, 1964-2002.

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1964	7/31	Paddock		378		Survey conditions fair. Helicopter.
	8/11	Paddock		55		Visibility poor. Helicopter.
	8/11-8/14	Paddock & Siedelman	104			Peak of spawning long past. Poor survey (turbid).
1966	7/31-8/03	Redick	633			Spawning at or near peak.
1967	7/24-7/26	Paddock	289			Poor visibility. Estimated 600 fish present.
1968	7/17	Whitehead		282		Pre-peak. Helicopter.
	7/17	Meyers		242		Pre-peak. Helicopter.
	7/20	Whitehead		868		Optimum coditions. Count from H-21 Helicopter.
	7/20	Meyers		575		Optimum coditions. Count from H-21 Helicopter.
	7/20-7/23	Whitehead & Meyers	2,204			Counting conditions optimum.
1969	7/23-7/25	Parkinson & Berry	2,722			Pre-peak. Count fair-to-poor last 2 days (weather).
1970	7/19	Whitehead		260		Counting conditions poor. Pre-peak.
1971	7/28	Cunningham		704		Visibility was good.
1972	7/29	Siedelman		1,224		Peak of spawning.
1973	8/01	Siedelman		115		Visibility only fair. Survey possibly post-peak.
1974	7/15	Russell		164	350	Pre-peak. Many fish holding in pools.
	7/28	Russell		495	625	At or near peak. Only one carcass obsd. Good vis.
1975	7/28	Russell		279	375	Survey pre-peak. Good viewing conditions.
	8/10	Russell	67			Floated only lower 12 miles of creek.
	8/17	Russell		0		Excellent viewing conditions. Spawning is done.
1976	8/03	Bill		180	400	Peak within next 3 days.
1977	7/29	Russell		1,860	2,350	At peak of spawning.
1978	8/09	Gwartney			350	Past peak. Viewing good. Most fish dead or spent.

(Continued)

Appendix Table 5. (page 2 of 2).

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1979	??	Gwartney			1,750	
1980	8/08	Bill				Creek too high & muddy to census.
1981	7/30	Russell		591	1,500	Peak of spawning in progress. Vis = fair-to-poor.
1982	8/07	Bill		980	3,920	Good visibility.
1983	8/14	Bill		460	1,400	Poor visibility. Muddy. 30% spawners dead already.
1984	8/08	Bill		385	1,155	
1988	8/08	Minard		600		At peak.
1989	8/14	Minard		100		Past peak.
1990	8/06	Minard		350		
1991	7/30	Russell		100		Pre-peak and water clarity only "Fair".
	8/05	Russell		275		Est. at spawning peak, most fish on redds, 2 dead.
1992	8/09	Russell		158		Post-peak as 47 dead counted & aband. redds numerous.
1993	7/31	Russell		700	900	Slightly pre-peak. Most fish on redds. Water clear.
1994	7/29	Russell		974		Slightly pre-peak. Most fish on redds. Only 6 carcasses.
1995	8/05	Russell		239		A little past peak. Several singles on redds. Vis. only
1996	8/05	Regnart		312		Slightly post peak. 26 dead counted.
1997	7/18	Regnart		902		Pre-peak and water clarity "Good".
1998	8/18	Regnart		1,060		Estimate is at peak of spawn.
1999	8/02	Morstad		847		Estimate near peak of spawn, fair to good conditions.
2000	8/01	Morstad		178		Estimate near peak, survey conditions fair
2001	8/02	Morstad		413		Estimate near peak, survey conditions fair
2002	31-Jul	Morstad		934		Estimate near peak, survey conditions excellent
Mean				507		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for conditions, river areacounting at time of survey.

Appendix Table 6. Chinook salmon escapement survey history, Paul's Creek, Naknek River drainage, 1971-2002.

Year	Count Dates	Surveyors	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1971	7/28	Cunningham	52		
1972	7/28	Siedelman	156		Prior to peak.
1973	8/01	Siedelman			Too murky to survey.
1974	7/15	Russell	2		
	7/26	Russell	91	250	Prior to spawning peak.
1975	7/28	Russell	144	225	Prior to peak. Good conditions.
1976	8/03	Bill	31	100	Poor conditions. Fish paired & spawning.
1977					No count.
1978	8/09	Gwartney		300	Past peak. 75% of fish dead.
1979					No count.
1980	8/08	Bill	17		All carcasses. Creek high & muddy.
1981					No count.
1982	8/07	Bill	340	1,020	Good visibility. Spawning near peak.
1983	8/14	Bill	290	800	Poor visibility.
1984	8/08	Bill	400	800	Fair visibility. About 25% dead already.
1985	8/06	Bill		170	Pre-peak.
1986	8/08	Meyer	73	236	Approximately 30% dead already.
1987	8/13	Russell	7		Poor survey conditions. Past peak.
	??	Meyer		400	Estimat 400 present based on jet boat surveys.
1988	8/08	Minard	150		At peak.
1989	8/14	Minard	50		Past peak. Excellent visibility.
1990	8/06	Minard	150		Excellent survey conditions.

(Continued)

Appendix Table 6. **(**page 2 of 2).

Year	Count Dates	Surveyors	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1991	7/30	Russell	121		Slightly pre-peak.Only 1 carcass noted.
1992	8/01	Russell	88		Slightly pre-peak.Stream clarity only "Fair".
1993	7/31	Russell	86	140	Slightly pre-peak.Overflew approx 60% of stream.
1994	7/29	Russell	203	300	Pre-peak...but many fish on redds.
1995	8/05	Russell	26		Water clarity poor. 5 carcasses noted
1996	8/05	Regnart	157		Peak of spawning. 12 dead counted.
1997	7/18	Regnart	248		Pre-peak. Excellent visibility
1998	8/18	Regnart	210		
1999	8/02	Morstad	223		Pre spawning, 10% on redds and two carcasses
2000	8/01	Morstad	43		Pre spawning, 10% on redds no carcasses
2001	7/31	Morstad	118		Near spawning peak conditions fair
2002	7/31	Morstad	314		Near spawning peak conditions good
Mean			140		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 7. Chinook salmon escapement survey history, Alagnak River, 1963-2002.

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1963	8/12	Siedelman		551		Excellent conditions. No side channels flown.
1966	8/06	Redick		13		Poor conditions.
	8/06-8/10	Redick	238			Nonvianuk & mainstem portions only (not
	8/11	Redick		1,465		Pre-peak. Still many fish upmigrating.
1967	8/16	VanValin		1,250		
1968	8/18	Siedelman		6,717	8,500	Fairly good survey.
1969	8/19	Siedelman		4,781	6,000	Marginal survey conditions, (20kn NW
1970	8/22	Siedelman		5,250	5,000	Peak of spawning. Visibility good
	8/22	Whitehead		4,590		Peak of spawning. Visibility good
1971	8/25	Siedelman		1,420	1,500	Water high, but count okay.
	8/25	Cunningham		1,475		
1972	8/23	Cunningham		2,256	2,400	Past peak. Many dead. Many unoccupied
1973	8/16	Russell		824	1,250	Near peak of spawning. No dead though.
1974	8/13	Russell		1,411	1,700	Pre-peak.
	8/19	Russell		1,596	1,900	Spawning near peak.
1975	8/17	Russell		6,620	7,250	About a week pre-peak. Some large groups
1976	8/16	Bill		7,593	8,750	Pre-peak. Not many dead yet.
1977	8/18	Bill		3,634	12,000	Pre-peak. Didn't count river below Pfaff Pond.
	8/18	Sanders		9,425		Pre-peak. Didn't count river below Pfaff Pond.
1978	8/24	Bill		11,650	25,100	
1979						No survey.
1980	8/08	Bill		2,020	5,090	Pre-peak. Fog over lower river.
	8/21	Bill		2,930	5,860	
1981	8/26	Bill		2,430	8,540	

(Continued)

Appendix Table 7. (page 2 of 2).

Year	Count Dates	Surveyors	Float Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1982	8/09	Bill		3,400	4,700	At least a weak too early.
	8/19	Bill		3,350	5,480	Peak survey.
1983	8/15	Bill		2,980	3,500	At peak of spawning.
1984	8/14	Bill		6,090	9,135	
1985	8/17	Bill		3,920	9,518	About peak for chinook spawning. 30% dead
1986	8/11	Bill		3,090	7,200	Peak of spawning.
1987	8/22	Bill		2,420		
1988	8/12	Bill		4,600		
1989	8/15	Bill		3,650		
1990	8/08	Bill		1,720		
1991	8/09	Regnart		2,023		Pre-peak. Most fish schooled yet. Few on
	8/19	Regnart		2,531		Near peak. Most fish on redds.
1992	8/10	Regnart		3,042		Pre-peak. Most fish still schooled.
	8/21	Regnart		2,275		Near peak...but water clarity worse than
1993	8/09	Regnart		10,170		Near peak. Most on redds.
1994	8/08	Regnart		8,480		About half the fish on redds. Others schooled.
1995	8/10	Regnart		6,860		About 2/3 of chinook noted on redds.
1996	8/12	Regnart		9,885		Near peak. Most on redds.
1997	8/7	Regnart		15,210		Peak. Excellent visibility
1998	8/12	Anderson		4,148		About 1/3 of braids poor light; most on redds.
1999	8/10	Morstad		2,178		Peak of spawning, good survey conditions
2000	8/7	Morstad		2,220		Peak of spawning, good survey conditions
2001	8/8	Morstad		5,458		Near peak, high water survey conditions good
2002	8/2	Morstad		3,765		Near peak, survey conditions good
Mean			238	4,213		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 8. Chinook salmon escapement survey history, Kvichak River, 1932-2002.

Year	Count Dates	Surveyor	Weir Count	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1932	6/28-8/5		5,753			Peak count was on 7/05 (1,168 fish).
1976	8/16	Bill		35	45	Survey timed to count pink salmon.
1980[b]	8/08	Bill		900	1,000	Chinook actively spawning.
1984	8/14	Bill		200		
1988	8/13	Bill		190	570	Nearly all on redds.
1989	8/16	Bill		100	260	
1990	8/19	Bill		170	510	
1992	8/13	Regnart		264		All fish on redds in Kaskanak Flats.
1993	8/16	Regnart		115		All fish on redds in Kaskanak Flats.
1994	8/12	Regnart		306		
1995	8/14	Regnart		96		
1996	8/18	Regnart		132		
1997	8/15	Regnart		103		
1998	8/14	Anderson		187		All fish on redds in Kaskanak Flats
1999	8/10	Morstad		1,200		
2000	8/07	Morstad		6		
2001	8/08	Morstad		36		
2002	No survey					
Mean			5,753	253		

[a] Surveyor's subjective estimate of instantaneous population of chinook salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

[b] Pecks Creek, a Kvichak River tributary, was float surveyed 7/30-8/03, 1980 by R. Russell and 99 spawning chinook salmon were counted.

Appendix Table 9. Chinook salmon escapement data, Naknek-Kvichak District, 1970-2(

Year	Non-expanded Escapement Indices by Drainage [a]			Total
	Naknek	Alagnak	Kvichak	
1970	4,145 [b]	5,250		9,395
1971	2,885	1,420		4,305
1972	2,791	2,256		5,047
1973	2,536 [b]	824		3,360
1974	1,446 [c]	1,596		3,042
1975	3,452	6,620		10,072
1976	7,131	7,593	35	14,759
1977	6,690 [b]	3,634		10,324
1978	[d]	11,650		11,650
1979	[d]	[d]		0
1980	347 [e]	2,930	900	4,177
1981	4,271 [b]	2,430		6,701
1982	8,610	3,400		12,010
1983	7,830	2,980		10,810
1984	4,995	6,090	200	11,285
1985	590 [f]	3,920		4,510
1986	3,917	3,090		7,007
1987	4,450	2,420		6,870
1988	11,730	4,600	190	16,520
1989	2,710	3,650	100	6,460
1990	7,000	1,720	170	8,890
1991	4,391	2,531		6,922
1992	2,691	3,042	264	5,997
1993	8,016	10,170	115	18,301
1994	9,678	8,480	306	18,464
1995	4,960	6,860	96	11,916
1996	5,010	9,885	132	15,027
1997	10,453	15,210	103	25,766
1998	5,505	4,148	187	9,840
1999	3,320 [c]	2,178	1,200	6,698
2000	3,233	2,220	6	5,459
2001	6,340	5,458	36	11,834
2002	7,503	3,765		11,268
Mean [g]	4,723	4,782	253	9,758

[a] Includes aerial indices from all streams surveyed in drainage.
[b] No index count for Paul's Creek.
[c] No index count for Naknek River.
[d] No non-expanded index counts exist for this year.
[e] Includes only index counts for mainstem Naknek River, Paul's Creek, & Big Creek.
[f] Naknek River mainstem only.
[g] Sum of mean indices.

Appendix Table 10. Chum salmon escapement survey history, Alagnak River, 1961-2002.

Year	Count Dates	Surveyors	Tower Counts	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1961			18,906			
1962			3,846			
1963	8/12	Siedelman	20,124	4,120		
1964			2,562			
1965			132			
1966						
1967			9,990			
1968			72			
1969			210			
1970			5,790			
1971			402			
1972			48			
1973						
1974						
1975						
1976	8/16	Bill		2,125	5,250	
1977	8/18	Bill		35,000		
1978	8/24	Bill		9,900		
1979						
1980	8/21	Bill		7,300	14,600	
1981	8/26	Bill		75,000	75,000	
1982	8/09	Bill		14,000	42,000	
	8/19	Bill		12,000	30,000	
1983	8/15	Bill		8,800		Pre-peak.

(Continued)

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Year	Count Dates	Surveyors	Tower Counts	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1984	8/14	Bill		48,000	87,500	
1990	8/08	Bill		8,500	30,000	Pre-peak.
	8/18	Bill		48,800		Close to peak of spawning.
1991	8/09	Regnart		43,000		Pre-peak.
	8/19	Regnart		64,300		Peak of spawning.
1992	8/10	Regnart		114,000		Near Peak.
1993	8/09	Regnart		4,600		Near Peak.
1994	8/08	Regnart		62,900		Near Peak.
1995	8/10	Regnart		132,000		Near Peak.
1996	8/12	Regnart		145,000		Near Peak
1997	8/07	Regnart		37,800		Near Peak
1998	8/12	Anderson		3,150		Poor survey conditions
1999	8/10	Morstad		11,800		Near Peak
2000	8/07	Morstad		10,120		Near Peak
2001	8/08	Morstad		70,800		At peak
2002	8/02	Morstad		157,800		At peak
Mean			4,370	45,233	40,621	

[a] Surveyor's subjective istimate of instantaneous population of chum salmon spawners in the river at time of aerial survey, based on survey conditions, coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for river area counting at time of survey.

Appendix Table 11. Pink salmon escapement survey history, Alagnak River, 1968-2002.

Year	Count Da	Surveyor	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1968	8/27	Siedelman	97,000	125,000	
1970					No survey.
1972					No survey.
1974	8/14	Bill	20,600		Big schools. Pre-peak.
1976	8/16	Bill	6,375	13,000	Pre-peak.
1978	8/24	Bill	330,300	736,000	Just starting to spawn. Many still in lower
1980	8/21	Bill	121,000	242,000	
1982	8/09	Bill	21,300	63,900	
	8/19	Bill	24,800	43,000	Pre-peak.
1984	8/14	Bill	296,500	567,100	Survey too early for peak. Most fish
1986	8/11	Bill	48,600	145,800	
1988	8/12	Bill	415,000	620,000	Pre-peak.
1990	8/08	Bill	45,100		
	8/18	Bill	240,500		Estimated to be about 1 week pre-peak.
1992	8/10	Regnart	15,000		Pre-peak.
1994	8/08	Regnart			No pinks noted.
1996	8/12	Regnart			No pinks noted.
1998	8/12	Anderson	3,200		High water poor light conditions
2000	8/7	Morstad	30,000		
2002	8/2	Morstad	127,500		Survey too early for peak. Most fish
Mean			114,352	212,983	

[a] Surveyor's subjective estimate of instantaneous population of pink salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting a time of survey.

Appendix Table 12. Pink salmon escapement survey history, Kvichak River, 1966-2002.

Year	Count Dates	Surveyor	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1966		Robertson		67,500	
1968	8/26	Siedelman		88,000	
1970					No survey.
1972					No survey.
1974	8/14	Bill		30,560	
1976	8/16	Bill		16,100	Most still schooled.
1978	8/28	Bill	88,000	440,000	Still numerous fish migrating & some
1980	8/08	Bill	7,000	25,000	Still schooled.
1982					No Survey.
1984	8/14	Bill	111,000	165,000	
1986					No survey.
1988	8/13	Bill	94,000		
1990	8/19	Bill	25,300	47,000	
1992					No survey.
1994					No survey.
1996					No Survey
1998					No Survey.
2000	8/07	Morstad	7,000		Still schooled.
2002					No survey
Mean			55,383	109,895	

[a] Surveyor's subjective estimate of instantaneous population of pink salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 13. Pink salmon escapement survey history, Naknek River, 1974-2002.

Year	Count Dates	Surveyor	Non-expanded Aerial Index Count	Expanded Aerial Index Estimate [a]	Comments
1974	8/14	Bill	161,800	362,000	
1976	8/13	Bill	94,600	110,000	Just pre-peak. Many still schooled.
1978	8/24	Bill	312,000	780,000	
1980	8/08	Bill	80,000	160,000	Pre-peak.
1982	8/19	Bill	33,600	34,000	Pre-peak.
1984	8/14	Bill	27,000	125,000	
1986	8/18	Russell	286,000	375,000	Most fish still schooled and holding. Pre-peak.
1988	8/24	Russell	187,000		
1990	8/18	Bill		65,000	
1992					No survey.
1994					No survey.
1996					No Survey.
1998					No survey.
2000	8/07	Morstad	10,000		
2002	8/28	Morstad	20,000		main stem only
Mean			132,444	251,375	

[a] Surveyor's subjective estimate of instantaneous population of pink salmon spawners in the river at time of aerial survey, based on survey conditions, river area coverage, water clarity, etc. Does not include expansion for earlier or later run fish not available for counting at time of survey.

Appendix Table 14. Aerial survey counts of chinook salmon escapement, Egegik District, 1981-2002. [a]

Year	Egegik River	Shosky Creek	Whale Mountain Creek	Mossy Creek	Mink Creek	Gertrude Creek	Kaye's Creek	Takayoto Creek	Angle Creek[i]	Contact Creek	King Salmon River	Total
1981						515						515
1982	300					900				300		1,500
1983						860		380		375		1,615
1984	40	300				600		350		110		1,400
1985	75	80	0	15	10	260	230	315		95		1,080
1986	65	150	48	0	0	150	46	40		18	15	532 [b]
1987	15	174	2	74	0	408	284	232	2	88		1,279
1988	50	151	0	12		248	120	177		110		868
1989	14	90	13	43	7	310	120	300		100		997
1990	24 [c]	85	7	35	2	260	175	175		205		968
1991	0 [c]	62	60	30	33	83	117	95		73		553
1992[d]	15	143	52	54	22	416	320	190		296		1,508
1993	80	58	6	38	6	350	170	200		235		1,143
1994[u]	66 [c]	48	32	118	77	840	214	230		705		2,330
1995[u]	60 [c]	32	10	53	103	456	248	130		275		1,367
1996	42 [c]	102	8	38	20	230	74	123	6	203	[g]	846
1997	30 [c]	39	2	18	10	260	173	374	[g]	740	[g]	1,646
1998	0 [c]	29	45	55	[g]	320	165	120	[g]	329	[g]	1,063
1999	6 [c]	75	10	51	[g]	165	6	115	[g]	145	[g]	573
2000	0 [c]	4	0	16	[g]	85	41	73	[g]	341	[g]	560
2001	0 [c]	32	0	35	[g]	116	120	153	[g]	299	[g]	755
Average	46	92	17	40		373	154	199	4	252	15	1,100
2002	0 [c]	24	4	0	[g]	277	220	149	[g]	238	[g]	912
Deviation [e]		-74%	-77%	-100%		-26%	43%	-25%		-6%		-17%

[a] Peak aerial counts unless otherwise noted. Data not expanded.
[b] Survey 10-14 days later than normal.
[c] Tower count.
[d] Helicopter surveys.
[e] 2002 deviation from 1981-2001 average.
[i] Angle Creek is usually too turbid to survey.
[g] No Count.

Appendix Table 15. Aerial survey counts of chum salmon escapement, Egegik District, 1982-2002.[a]

Year	Egegik River	Shosky Creek	Whale Mountain Creek	Mossy Creek	Mink Creek	Gertrude Creek	Kaye's Creek	Takayoto Creek	Angle Creek[b]	Contact Creek	King Salmon River	Total
1982						12,000				2,000		14,000
1983	6[c]					5,000		3,500		6,000		14,500
1984	800	200				13,000		2,400		10,000		26,400
1985	400	0	600	200	35	2,600	800	0		500	50	5,185
1986	0	0	6,025			140	3	5	0	15	25	6,213[d]
1987	150	0	19,000	16	1,000	3,770	2,780	0		2,850		29,566
1988	500	50	4,400	100	50	5,200	1,600	0		3,200		15,100
1989	0	10	3,200	25	100	1,100	0	0		200	14	4,649
1990	72[c]	0	2,000	0	150	1,675	80	0		750		4,727
1991	0[c]	0	1,500	70	100	990	280	0		480		3,420
1992[e]	50	0	680	15	25	4,500	400	0		3,630	200	9,500
1993	100	0	1,020	8	1	1,075	0	0		100		2,304
1994[e]	42[c]	0	1,700	5	7	760	175	30		260		2,979
1995[e]	144[c]	2	395	15	30	560	162	5		600		1,913
1996	12	[f]	438	4	20	530	[f]	24	[f]	633	[f]	1,661
1997	0[c]	[f]	220	8	10	495	290	60	[f]	640	[f]	1,723
1998	17[c]	8	1,480	4	[f]	920	4	4	[f]	140	[f]	2,577
1999	6[c]	[f]	1,040	4	[f]	243	[f]	4	[f]	140	[f]	1,437
2000	0[c]	[f]	492	4	[f]	475	32	6	[f]	180	[f]	1,189
2001	0[c]	[f]	424	6	[f]	494	40	30	[f]	1,240	[f]	2,234
Average	127	21	2,624	30	127	2,776	443	319	0	1,678	72	7,564
2002	0[c]	[f]	284	5	[f]	302	16		[f]	150	[f]	757

[a] Peak aerial counts unless otherwise noted. Data not
[b] Angle Creek is usually too turbid to survey.
[c] Tower count.
[d] Survey 10-14 days later than normal.
[e] Helicopter surveys.
[f] No Count.

Appendix Table 16. Aerial survey counts of pink salmon escapement, Egegik District, 1974-2002.a

Year	Egegik River	Whale Mountain Creek	Gertrude Creek	Contact Creek	Other	Total
1974	3,912 [b]					3,912
1976	0 [b]					0
1977	84 [b]					84
1980	0 [b]					0
1982	15,000					15,000
1983			58 [c]			58
1984	17,000					17,000
1985						
1986	2,500					2,500
1987						
1988	23,000					23,000
1989	300					300
1990	17,000		40 [c]			17,040
1991		88 [u]	24 [u]	36 [u]		148
1992[e]	6 [b]	10			3	13
1993	50					50
1994	21,282 [b]					21,282
1995	24 [b]					24
1996	103,116 [b]					103,116
1997	0 [b]		1,290 [r]			1,290
1998	2 [b]		2,487 [r]			2,489
1999	6 [b]		1,125 [r]			1,131
2000[g]	0 [b]					
2001[g]	0 [b]					
Average	12,703	49	837	36	3	10,422
2002[g]	0 [b]					

[a] Non-expanded aerial peak counts unless otherwise noted.
[b] Tower counts.
[c] Float count.
[u] Foot survey (USFWS).
[e] Helicopter surveys.
[r] Gertrude Creek Weir count.
[g] No Counts.

Appendix Table 17. Aerial survey counts of coho salmon escapement, Egegik District, 1981-2002.

Year	Number of Surveys	Coho Salmon Count	Comments
1981	1 [a]	4,000	Only Becharof tributaries surveyed.
1982	1	20,000	Surveyed on August 20.
1983	0	0	No surveys done.
1984	3	43,225	40,000 counted in Egegik Lagoon on August 15.
1985	3	5,260	Peak surveys on August 26.
1986	1	12,575	Surveyed August 19.
1987	6	6,930	Included King Salmon River & tributaries.
1988	6	13,715	Included King Salmon River & tributaries.
1989	9	4,485	Included Gertrude & Whale Mountain Creeks.
1990	7	13,400	Peak survey on August 17.
1991	0	220	Incidental observation made August 6.
1992 [b]	0	200	Incidental observation in Egegik River August 6.
1993	0	1,130	Incidental observation from Egegik River August 16.
1994 [b, c]	2	7,412	Included King Salmon River & tributaries.
1995 [d]	2	5,258	Included King Salmon River & tributaries.
1996 [e]	2	9,043	Included King Salmon River & tributaries.
1997	3	4,106	Gertrude Weir Count & selected Becharof Lake tributaries.
1998	1	6,075	Gertrude Weir Count & selected Becharof Lake tributaries.
1999	1	4,353	Gertrude Weir Count & selected Becharof Lake tributaries.
2000	1	4,870	Selected Becharof Lake tributariers
2001	1	5,100	Selected Becharof Lake tributariers
2002	1	7,050	Selected Becharof Lake tributariers

[a] Survey done by USFWS personnel.

[b] Helicopter surveys.

[c] The Egegik River Tower was maintained through September 11 and approximately 10,140 coho salmon were counted.

[d] The Egegik River Tower was maintained through August 30 and approximately 7,470 coho salmon were counted.

[e] The Egegik River Tower was maintained August 7 to September 11 and approximately 24,918 coho salmon were counted.

Appendix Table 18. Aerial survey counts of chinook salmon escapement, Ugashik District, 1980-2002.

Year	Ugashik River	Dog Salmon River [f]	King Salmon	Painter Creed	Pumice Creek	Old Creek	Total
1980	0 [a]		900	1,000			1,900
1981	18 [a]		50	300			368
1982	0 [a]		700	700			1,400
1983	50 [a]	1,635	525	635	1,800	660	5,305
1984	108 [a]	836	4,100	1,875	1,100	880	8,899
1985	150 [b]	560	4,600	410	930	410	7,060
1986	66 [b]	252	1,777	646	705	739	4,185
1987	54 [a]	751	981	1,051	1,602	1,155	5,594
1988	249 [c]	900	5,820	1,170	1,025	660	9,824
1989	226 [bc]	848	1,670	1,030	510	520	4,804
1990	67 [ac]	540	1,500	590	450	610	3,757
1991	131 [ac]	449	700	365	375	420	2,440
1992[d]	260 [ac]	821	1,260	855	750	815	4,761
1993	188 [ac]	579	1,970	865	450	635	4,687
1994[d]	233 [ac]	1,741	2,225	1,005	2,530	1,490	9,224
1995	149 [ac]	882	440	366	501	505	2,843
1996	76 [ac]	1,079	1,200	403		30	2,788
1997	839 [ac]	906	802	525	536	558	4,166
1998	458 [ac]	1,411	883	1,230	352	438	4,772
1999	237 [ac]	535		166	340	213	1,491
2000	26 [a]	425		314	339	246	1,350
2001	346 [abc]	929	828	563	646	530	3,842
Average	179	846	1,647	730	830	606	4,339
Deviation [e]	246%	32%	-74%	-35%	-29%	-33%	-16%
2002	618 [abc]	1,121	430	472	586	408	3,635

[a] Tower counts

[b] Tower count plus later aerial survey counts of main river.

[c] Survey included Grassy Creek (tributary downstream of Ugashik Lagoon).

[d] Helicopter surveys.

[e] 2002 deviation from 1980-2001 average.

[f] Includes Figure-Eight, Goblet, Oldham, and Wandering Creeks.

Appendix Table 19. Aerial survey counts of chum salmon escapement, Ugashik District, 1980-2002.

Year	Ugashik River	Dog Salmon River [h]	King Salmon River	Painter Creek	Pumice Creek	Old Creek	Other	Total
1980	18 [a]		7,000	3,000				10,018
1981	0 [a]		200					200
1982	12 [a]		19,000	35,000			650	54,662
1983	0 [a]	1,650	2,700	4,000	20,000 [b]	3,300		31,650
1984	132 [a]	750	119,000	16,000	16,000	14,500	2,500	168,882
1985	42 [c]	350	20,000	1,925	6,000	670	300	29,287
1986	0 [c]	120	8,650	1,200	2,000	630	125	12,725
1987	130 [c]	340	9,750	2,290	10,340	2,090	40	24,980
1988	752 [c,d]	2,290	25,000	10,500	11,650	5,800	950	56,942
1989	600 [c,d]	1,005	7,500	3,700	2,200	2,010	625	17,640
1990	312 [c,d]	170	6,200	1,150	1,630	410	10	9,882
1991	315 [c,d]	240	7,400	750	2,550	2,525	130	13,910
1992[e]	510 [a,c,d]	1,210	8,525	4,000	14,000	15,000	0	43,245
1993	93 [c,d]	105	7,000	720	2,040	1,025	8	10,991
1994[e]	66 [a,c]	851	9,150	1,625	12,750	6,975	150	31,567
1995	6 [a,c]	160	3,900	1,370	2,600	1,800	0	9,836
1996	138 [a]	85	16,500	700	7,400	2,500	0	27,323
1997	100 [a,c]	450	10,500	4,200	5,300	9,480	115	30,145
1998	607 [a,c]	840	10,600	3,800	2,000	4,350	224	22,421
1999	278 [a,c]	400		650	1,660	2,020	50	5,058
2000	7 [a]	510		2,150	7,300	5,850		15,817
2001	78 [ac]	1,140	8,100	6,000	13,500	7,800	200	36,818
Average	191	667	15,334	4,987	7,417	4,670	338	30,182 [f]
Deviation [g]	-100%	50%	-47%	-38%	-31%	-10%	-70%	-28%
2002	0 [ac]	1,000	8,200	3,100	5,100	4,200	100	21,700

[a] State tower counts, (Federal tower count was 5,700 in 2001, and 912 in 2002.)

[b] Float count done from a raft.

[c] Survey included Grassy Creek (tributary downstream of Ugashik Lagoon).

[d] Included tower count plus later aerial surver count.

[e] Helicopter surveys.

[f] Average of the sums of indices for all locations.

[g] 2002 deviation from 1980-2001 average.

[h] Includes Figure-Eight, Goblet, Oldham, and Wandering Creeks.

Appendix Table 20. Aerial survey counts of pink salmon escapement, Ugashik District, 1980-2002.

Year	Number of Surveys [a]	Pink Salmon Count	Comments
1980	1	2,000	
1982	1	6,000	4,000 in King Salmon River, 2,000 in Painter Creek.
1983	2	803	Survey of Dog Salmon River conducted by USFWS.
1984	3	656	650 counted in King Salmon River during September 21
1985	3	0	
1986	1	350	Observed in King Salmon River on August 19.
1987	2	1	
1988	7	2,800	Peak count on August 23: 2,000 in King Salmon River.
1989	8	50	Observed in Ugashik River on August 9.
1990	5	2,000	Peak count on August 13.
1991	0	660	Ugashik River tower count.
1992 [b]	0	1,728	Ugashik River tower count.
1993	0	0	
1994 [b]	0	425	Observed near Ugashik Lake Outlet on August 11.
1995	0	36	Ugashik River tower count.
1996	0	550	Observed in King Salmon River on August 12.
1997	0	0	
1998	0	57	Ugashik River tower count.
1999	0	6	Ugashik River tower count.
2000	0	46	Ugashik River tower count.
2001 [c]	0	708	Ugashik River tower count.
2002 [d]	0	714	Ugashik River tower count.

[a] Zero indicates no surveys designated to look for pink salmon and any oberservations recorded would be incidental to surveying for other species.

[b] Helicopter survey.

[c] Includes 66 from State tower count and 642 from Federal tower count.

[d] Includes 24 from State tower count and 690 from Federal tower count.

Appendix Table 21. Aerial survey counts of coho salmon escapement, Ugashik District, 1981-2002.

Year	Number of Surveys	Coho Salmon Counts	Comments
1981	1	13,300	Surveyed on September 7.
1982	1	10,000	Surveyed on August 26.
1983	0		
1984	1	6,100	Surveyed on August 31.
1985	2	18,880	16,500 in King Salmon River on September 12.
1986	2	8,455	Surveyed on August 19 and 25.
1987	2	17,000	16,700 in King Salmon River on August 23.
1988	7	28,280	12,900 in King Salmon River on September 7.
1989	4	11,515	7,615 observed on August 14.
1990	5	12,610	
1991	0	400	Incidental observation made August 12.
1992[a]	0	790	Incidental observation made August 11.
1993	0	705	Incidental observation made August 16.
1994[a]	0	760	Incidental observation made August 11.
1995	0		
1996 [p]	1	8,275	Surveyed on September 27 and 28.
1997 [p]	2	9,400	Surveyed on September 30 and October 17.
1998 [p]	1	1,459	Surveyed on November 19.
1999[p]	1	10,210	Surveyed on October 14.
2000[p]	1	12,070	Surveyed on October 12.
2001[p]	1	4,540	Surveyed on September 27.
2002[p]	1	3,805	Surveyed on September 22.

[a] Helicopter survey.
[p] Surveys are of selected areas in the Ugashik Lakes, King Salmon and Dog Salmon River drainages.

Appendix Table 22. Spawner distribution and total escapement estimates of sockeye salmon, Wood River system, 1

Year	Spawner Distribution (%)			Total Escapement[a]
	Creeks	Beaches	Rivers	
1959	32.8	50.3	16.9	2,209,300
1960	27.4	55.5	17.1	1,016,100
1961	11.4	32.3	56.3	460,700
1962	24.0	65.2	10.8	873,900
1963	12.1	68.5	19.4	721,400
1964	18.9	64.0	17.1	1,076,100
1965	40.6	11.1	48.3	675,100
1966	16.4	54.9	28.7	1,208,700
1967	9.3	66.2	24.5	515,800
1968	9.9	50.8	39.3	649,300
1969	8.6	42.4	49.0	604,300
1970	14.0	52.4	33.6	1,162,000
1971	11.2	56.8	32.0	851,200
1972	17.4	45.1	37.5	430,600
1973	11.5	23.9	64.6	330,500
1974	14.1	63.9	22.0	1,708,800
1975	14.5	34.4	51.1	1,270,100
1976	12.7	33.5	53.8	817,000
1977	11.3	39.5	49.2	561,800
1978	14.2	51.3	34.5	2,267,200
1979	7.3	60.4	32.3	1,706,400
1980	20.8	24.5	54.7	2,969,000
1981	23.0	20.7	56.3	1,233,000
1982	14.0	17.2	68.8	976,400
1983	14.3	60.9	24.8	1,361,000
1984	11.4	27.6	61.0	1,002,800
1985	18.6	22.2	59.1	939,000
1986	16.1	23.3	60.6	819,000
1987	27.6	56.1	16.3	1,337,000
1988	31.0	44.4	24.6	866,800
1989	19.6	28.9	51.5	1,186,400
1990				1,069,400
1991			19.0	1,159,900
1992	24.9	56.7	18.4	1,286,300
1993	40.9	34.1	25.0	1,176,100
1994	25.5	36.4	38.1	1,471,900
1995	33.5	52.9	13.6	1,482,200
1996	25.8	39.3	34.9	1,649,600
1997	15.6	60.8	23.6	1,512,400
1998	20.0	66.2	13.8	1,755,800
1999				1,512,400
2000				1,300,000
2001				1,458,700
Mean	19.0	44.6	36.0	1,167,871
2002				1,283,700

[a] Estimated from Wood River tower counts. Rounded to the nearest hundred.

Appendix Table 23. Total escapement estimates of pink salmon, Nushagak and Togiak District, 1962-2002.[a]

Year	Nushagak District[b]	Togiak District[c]
1962	543,000	
1964	910,560	
1974	585,520	8,620[d]
1976	863,430	37,570
1978	9,386,480	150,000[d]
1980	2,785,200	102,820
1982	1,656,660	44,300
1984	2,926,450	269,950
1986	72,190[e]	80,000[d]
1988	494,610[e]	142,500[d]
1990	801,730[e]	207,000
1992	[f]	235,000[d]
1994	192,780[e]	88,000[d]
1996	821,312[e]	[f]
1998	132,400[e]	134,780[d]
2000	135,285[e]	[f]
Mean	1,487,174	125,045
2002	317,659[e]	[f]

[a] Only those years of comprehensive aerial coverage are included: even years only; all counts rounded to the nearest 10 fish.

[b] Includes Wood, Igushik, Snake, Nushagak, and Nuyakuk Rivers, and Ice, Youth, and Sunshine Creeks, unless otherwise noted.

[c] Includes Togiak, Matogak and Osviak Rivers; 1982, 1990 and 1998 also Include Slug River.

[d] Togiak River estimate only.

[e] Sonar estimate of Nushagak-Mulchatna Rivers only.

[f] No escapement estimate.

Appendix Table 24. Aerial estimates of sockeye salmon escapements, Togiak District, 1982 - 2002.[a]

Year	Togiak River & Tributaries[b]	Kulukak Systems[c]
1982	25,300	52,800
1983	13,200	27,000
1984	30,900	49,800
1985	8,800	36,600
1986	35,000	42,800
1987	28,600	37,800
1988	32,400	31,700
1989	19,800	10,800
1990	47,100	49,600
1991	23,700	23,900
1992	16,500	26,400
1993	15,900	31,800
1994	19,400	29,700
1995	25,500	14,600
1996	30,200	19,000
1997	20,600	8,000
1998	21,900	13,000
1999	40,200	12,300
2000	40,300	22,400
2001[d]	6,700	17,000
1982-01 Mean (20-Year)	25,100	27,850
1982-91 Mean (10-Year)	26,480	36,280
1992-01 Mean (10-Year)	23,720	19,420
2002	16,175	8,500

[a] All counts are rounded to the nearest hundred.

[b] Estimates do not include fish spawning above the counting tower (Togiak Lake outlet); estimates for Ungalikthluk, Osviak,. Matogak and Slug Rivers are not included in the 1977-94 data as reported in Bristol Bay Data Reports 73 and 81.

[c] Includes Kulukak River, Kulukak Lake, and Tithe Creek Ponds.

[d] Togiak count includes only the Togiak mainstem and Ongivinuk Rivers.

Appendix Table 25. Peak aerial counts of live sockeye salmon, Togiak River drainage, 1982 - 2002.

Year	Togiak Mainstem	Gechiak River	Pungokepuk River	Narogurum River	Kashaiak River	Ongivinuk River	Total
1982	2,300	3,600	2,500	0	100	4,800	13,300
1983	4,800	1,100	700	0	0	1,200	7,800
1984	10,550	2,800	2,450	0	0	2,300	18,100
1985	1,800	400	500	0	0	1,700	4,400
1986	13,500						13,500
1987	5,200	3,600	600	0	0	4,900	14,300
1988	9,400	2,000	1,100	0	0	3,700	16,200
1989	7,600	1,500	630			150	9,880
1990	8,770	5,720	5,980	0	2,550	1,190	24,210
1991	7,990	1,640	1,220			1,010	11,860
1992	3,030	1,280	1,400			2,200	7,910
1993	2,300	1,270	540			2,950	7,060
1994	3,100	560	1,870			3,900	9,430
1995	3,260	1,745	1,000		4,200	2,330	12,535
1996	9,160	2,270	150	100	240	3,190	15,110
1997	8,200	1,600	450	50	650	2,800	13,750
1998	4,890	3,100	150	10	0	2,800	10,950
1999	5,400	11,275	1,475	100	75	6,700	25,025
2000	12,600	8,100	925	150	100	775	22,650
2001	3,260					100	3,360
Mean	6,356	2,976	1,313	34	609	2,563	13,850 [a]
%	45.9%	21.5%	9.5%	0.2%	4.4%	18.5%	100.0%
2002	2,050	5,000	75	1,525	0	1,450	10,100

[a] Sum of means for all streams.

Appendix Table 26. Peak aerial counts of live sockeye salmon, Togiak District, 1982-2002.

Year	Togiak River [a]	Kulukak River [b]	Tithe Creek Ponds	Quigmy River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total	
1982	13,300	11,900	19,300		0	1,000	5,500	300	2,400	53,700	
1983	7,800	8,430	2,720		80	20	2,000	230	940	22,220	
1984	18,100	7,400	14,000		200	6,800		100	5,200	51,800	
1985	4,400	6,700	11,600		0	200	2,300	260	1,310	26,770	
1986	13,500	10,900	14,000							38,400	
1987	14,300	10,500	8,400							33,200	
1988	16,200	12,600	3,250	250	100	380	5,880	200	2,700	41,560	
1989	9,880	2,920	2,500					5,000		20,300	
1990	24,210	10,600	14,200	100	400	2,200	3,540	9,700	3,800	68,750	
1991	11,860	8,650	3,320	35	860	2,530	560	3,400	2,650	33,865	
1992	7,910	7,530	4,950	40	300	3,340	1,460	3,600	3,760	32,890	
1993	7,060	9,600	6,300					3,100	5,680	31,740	
1994	9,430	10,270	4,600	580	990	1,750	6,070	2,230	3,240	39,160	
1995	12,535	3,000	4,310	200	610	1,470	2,820	390	1,720	27,055	
1996	15,110	2,490	7,000		360	780	1,045	1,000		27,785	[d]
1997	13,750	2,300	3,000		360	780	1,045	1,000		22,235	
1998	10,950	2,175	4,300	20	900	2,600	5,010	2,300	240	28,495	
1999	25,025	3,250	3,200	1,100	2,400	750	1,400	1,625	625	39,375	
2000	22,650	6,100	5,075	125	526	1,512	1,201	2,175	575	39,939	
2001	3,360	5,140	3,500	160	370	210	4,620	740	2,340	20,440	
Mean	13,067	7,123	6,976	261	529	1,645	2,963	2,075	2,479	37,117	[e]
%	35.2%	19.2%	18.8%	0.7%	1.4%	4.4%	8.0%	5.6%	6.7%	100.0%	
2002	10,100	2,375	1,875	660	1,450	1,705	371	160	0	18,696	[f]

[a] Includes all surveyed sections of Togiak River proper and all tributaries to the Togiak River.

[b] Includes surveys of Kulukak Lake. Counts prior to 1977 include Kulukak Lake only and are not included in the mean.

[c] Includes a combined count for the Negukthlik and Ungalikthluk of 4,500 fish.

[d] Complete count not available

[e] Sum of means for all streams.

[f] Togiak River count includes mainstem and Ongivinuk River only.

Appendix Table 27. Peak aerial counts of live chinook salmon, Togiak River drainage, 1982-2002.

Year	Togiak River Section [a] A	B	C	D	E	F	Gechiak River	Pungokepuk River	Nayorurun River	Kemuk River	Ongivinuk River	Total
1982					80	320	470	170	190	130	470	1,830
1983	120	220	370	290	360	850	820	240	340	430	350	4,390
1984	250	560	900	560	820	1,920	760	580	270	580	430	7,630
1985	270	320	640	340	470	970	470	250	290	310	460	4,790
1986	150	80	160	30	110	350						880
1987	20	70	170	120	200	480	610	180	100	120	320	2,390
1988	70	70	160	160	170	710	390	180	60	70	90	2,130
1989	10	30	370			940	190	80			40	1,660
1990	230	170	680	365	805	1,085	370	125	75	400	10	4,315
1991	505	165	475	225	520	455	460	105	90	100	150	3,250
1992	150	250	440	225	450	690	250	160	70	175	105	2,965
1993	170	120	220	160		1,810 [b]	595	240	130	65	440	3,950
1994				215	815	1,580	420	215	225	570	380	4,420
1995	120	220	750	255	800	800	715	140	425	520	295	5,040
1996	75	150	160	100	255	625	335	120	120	235	325	2,500
1997	100	350	1,300	600	820	1,000	275	180	150	275	100	5,150
1998	10	20	250	50	400	1,200	400	150	275	140	275	3,170
1999	150	210	540	510	225	480	365	90	240	305	270	3,385
2000	75	50	500	400	850	1,450	350	85	125	100	75	4,060
2001	610	500	500	200	300	950	700	270	550	1,050	160	5,790
Mean	171	198	477	267	469	933	471	187	207	310	250	3,940 [c]
%	4.3%	5.0%	12.1%	6.8%	11.9%	23.7%	11.9%	4.8%	5.3%	7.9%	6.3%	100.0%
2002	140	410	820	250	390	690	400	45	65	210	125	3,545

[a] Section A; Togiak Bay - Gechiak River
Section B; Gechiak River - Pungokepuk River
Section C; Pungokepuk River - Nayorurun River
Section D; Nayorurun River - Kashaiak River
Section E; Kemuk River - Ongivinuck River
Section F; Ongivinuck River - Togiak Lake

[b] Includes count for Section E.

[c] Sum of means for all streams.

Appendix Table 28. Peak aerial counts of live chinook salmon, Togiak District, 1982-2002.

Year	Togiak River [a]	Quigmy River	Kulukak River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1982	1,830	90	1,690	290	320		1,600	280	6,100
1983	4,390	40	2,460	190	120		1,080	260	8,540
1984	7,630	30	1,190	150	360		680	20	10,060
1985	4,790	0	540	100	50		80	90	5,650
1986	880								880
1987	2,390		300	30	40		660	80	3,500
1988	2,130	10	490	0	40	0	650	170	3,490
1989	1,660		740				560		2,960
1990	4,315	30	635	75	60	0	930	25	6,070
1991	3,250	25	285	75	100		1,175	55	4,965
1992	2,965	15	485	40	105	30	490	35	4,165
1993	3,950		1,140	80	110	100	830	70	6,280
1994	4,420	20	835	40	60	10	540	190	6,115
1995	5,040	35	430	65	135	50	740	80	6,575
1996	2,500	35	698	35	71	30	402		3,771
1997	5,150	10	310	50	65	33		10	5,628
1998	3,170	45	375	92	58	39	75	25	3,879
1999	3,385	10	240	105	40	150	345	130	4,405
2000	4,060	26	340	65	42	6	1,100	226	5,865
2001	5,790	24	330	58	84	2	201	74	6,563
Mean	3,685	28	711	86	103	38	674	107	5,432 [b]
%	67.8%	0.5%	13.1%	1.6%	1.9%	0.7%	12.4%	2.0%	100.0%
2002	3,545	28	860	54	62	7	1,203	161	5,920

[a] Includes all surveyed sections of Togiak River proper and all tributaries to the Togiak River.

[b] Sum of means for all streams.

Appendix Table 29. Peak aerial counts of live chum salmon, Togiak River drainage, 1982-2002.

	Togiak River Section [a]											
Year	A	B	C	D	E	F	Gechiak River	Pungokepuk River	Nayorurun River	Kemuk River	Ongivinuk River	Total
1982				200	1,200	2,500	500	400	1,300	100	1,000	7,200
1983	8,160	3,050	3,780	1,100	2,780	6,070	150	140	5,560	570	3,790	35,150
1984	3,900	6,300	800	0	2,600	6,400	3,700	2,000	4,200	700	3,500	34,100
1985	8,300	6,500	3,200	900	6,700	10,200	4,100	600	9,600	1,800	8,300	60,200
1986[b]												
1987	12,000	9,400	2,700	500	13,200	33,000	2,600	1,200	4,100	700	13,100	92,500
1988	10,000				4,900	3,800	3,700	5,000	3,500	200	3,800	34,900
1989		2,600	2,100		5,000	8,100	290	700			1,200	19,990
1990	2,200	1,275	1,350	400	650	4,200	3,150	1,150	3,400	250	125	18,150
1991	10,200	3,900	2,800	600	5,500	6,000	2,300	500	3,500	800	3,480	39,580
1992[c]	1,800	1,800	300	100	1,200	1,500	2,000	500	1,800	900	800	22,700 [d]
1993	6,500	3,500	2,300	60		4,400 [e]	1,950	450	4,380	620	3,500	27,660
1994				1,300	5,200	10,400	900	2,400	7,100	900	5,700	33,900
1995	15,700	7,100	4,700	1,800	6,800	5,900	4,800	1,900	9,700	2,700	8,200	69,300
1996	3,700	10,250	5,500	1,300	5,750	8,250	2,600	750	900	550	3,400	42,950
1997	3,900	3,100	3,800	2,750	7,100	4,550	3,200	800	4,750	1,800	3,900	39,650
1998	2,300	1,400	2,750	1,300	4,300	8,950	3,600	1,050	3,000	250	1,650	30,550
1999	3,975	1,950	2,375	1,300	1,725	2,200	1,840	440	4,230	480	2,540	23,055
2000[b]												
2001	9,400	6,500	5,250	1,000	3,500	9,850	7,800	2,850	200	21,450	6,000	73,800
Mean	7,160	4,773	3,100	967	4,807	7,928	2,775	1,314	4,339	2,117	4,305	43,584 [f]
%	16.4%	11.0%	7.1%	2.2%	11.0%	18.2%	6.4%	3.0%	10.0%	4.9%	9.9%	100.0%
2002	3,350	5,300	4,200	800	4,650	2,100	4,950	650	2,700	1,800	650	31,150

[a] Section A; Togiak Bay - Gechiak River
Section B; Gechiak River - Pungokepuk River
Section C; Pungokepuk River - Narogurum River
Section D; Narogurun River - Kashaiak River
Section E; Kemuk River - Ongivinuck River
Section F; Ongivinuck River - Togiak Lake

[b] No aerial surveys conducted.

[c] Counts by section are not representative due to post-peak survey, and are not included in the mean.

[d] Preferred total estimate; management survey count conducted 7/15/92.

[e] Includes count for Section E.

[f] Sum of means for all streams.

Appendix Table 30. Peak aerial counts of live chum salmon, Togiak District, 1982-2002.

Year	Togiak River [a]	Quigmy River	Kulukak River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1982	7,200	1,300	8,300	3,100	5,500	2,400	160	1,270	29,230
1983	35,150	4,900	12,960	7,600	11,900	1,210	300	7,360	81,380
1984	34,100	6,300	8,500	10,200	18,400		2,100	3,000	82,600
1985	60,200	1,800	7,800	2,860	5,460	8,800	130	14,650	101,700
1986									
1987	92,500	1,500	22,000	2,300	2,160				120,460
1988	34,900	10,800	35,000	12,000	17,400	7,600	400	11,300	129,400
1989	19,990	2,820	5,580	7,450	4,900		560		41,300
1990	18,150	555	5,550	1,475	2,300	3,650	750	1,300	33,730
1991	39,580	4,420	9,540	4,730	8,700		120	3,020	70,110
1992	22,700 [c]	600	4,800 [c]	4,400	7,100	1,700	100	4,000	45,400
1993	27,660		6,950	1,970	1,360	3,060	20	4,020	45,040
1994	33,900	890	10,700	1,630	2,000	4,360	230	1,090	54,800
1995	138,600	2,200	7,600	5,200	13,920	6,440	1,000	7,200	182,160
1996	42,950	960	7,560	560	810	2,670	40		55,550
1997	39,650	1,700	4,550	3,000	2,500	1,890			53,290
1998	30,550	2,630	2,700	4,980	3,870	1,060	150	1,300	47,240
1999	23,055	1,340	3,430	5,700	3,650	4,750	410	11,360	53,695
2000		2,870	4,950	9,090	10,880	4,150	200	5,520	37,660
2001	75,600	2,590	22,300	2,840	2,220	5,570	220	5,480	116,820
Mean	43,135	2,788	10,041	4,794	6,581	3,954	405	5,458	77,155 [b]
%	55.9%	3.6%	13.0%	6.2%	8.5%	5.1%	0.5%	7.1%	100.0%
2002	31,150	3,300	15,400	7,600	6,360	800	530	6,940	72,080

[a] Includes all surveyed sections of Togiak River proper and tributaries to the Togiak River.

[b] Sum of means for all streams.

[c] Preferred estimate from a management survey due to post-peak spawning ground survey.

Appendix Table 31. Peak aerial counts of live coho salmon, Togiak River drainage, 1982-2002.

Year	Togiak River Section [a] A	B	C	D	E	F	Mainstem Total	Gechiak River	Pungokepuk River	Narogurum River	Kashaiak River	Ongivinuk River	Total
1982	2,200	1,500	150	100	1,400	1,700	7,050	1,930	1,740	510	200	11,870	23,300
1983													
1984	1,440	1,190	200	120	620	1,480	5,050	4,750	2,240	990	1,110	6,140	20,280
1985	800 [c]	660 [c]	110 [c]	70 [c]	150	820	2,610	1,340	750	40	80	6,250	11,070
1986			60	400	100	400	960					2,560	3,520
1987	340	500	250	200	240	530	2,060	1,020	70			1,060	4,210
1988	950	370		140	210	360	2,030	1,530				4,100	7,660
1989													
1990	1,650	390	400	0	540	660	3,640	920	450	260	130	1,730	7,130
1991	4,900	400	700	600	1,680	140	8,020					100	140 [d]
1992	4,420	1,120	1,180	540	2,940	3,080	13,280	5,240	1,440	780	1,500	4,460	26,700
1993													
1994								1,290 [d]	220 [d]	120 [d]	95 [d]	1,930	3,655
1995								1,450			200	1,180	2,830
1996	2,550	1,090	150	250	1,600	5,020	10,910	2,080	1,170	575	725	6,450	21,910
1997	600	200	400	100	400	1,800	3,500	1,000	650	350	475	900	6,875
1998	460	625	100	100	310	1,075	2,670	2,550	575	400	500	1,750	8,445
1999	250	75	50	25	100	75	575	275	35	100	25	175	1,185
2000													
2001													
Mean	1,713	677	313	203	792	1,318	4,797	1,893	862	424	469	3,335	11,778 [b]
%	14.5%	5.7%	2.7%	1.7%	6.7%	11.2%	40.7%	16.1%	7.3%	3.6%	4.0%	28.3%	100.0%
2002													

[a] Section A; Togiak Bay - Gechiak River
Section B; Gechiak River - Pungokepuk River
Section C; Pungokepuk River - Narogurum River
Section D; Narogurum River - Kashaiak River
Section E; Kashaiak River - Ongivinuck River

[b] Sum of means for all streams.

[c] Proportional estimates based on 1984 data.

[d] Timing of aerial surveys did not coincide with the period of peak spawning activity, and therefore, counts were not included in the mean or percent.

Appendix Table 32. Peak aerial counts of live coho salmon, Togiak District, 1982-2002.

Year	Togiak River [a]	Quigmy River	Culukak River	Matogak River	Osviak River	Slug River	Negukthlik River	Ungalikthluk River	Total
1982	23,300		3,380						26,680
1983									0
1984	20,280		10,750	1,850	1,080	670			34,630
1985	9,430	200	7,790	610	420				18,450
1986	3,520								3,520
1987	4,210	30	910	440	120			130	5,840
1988	8,590	460	1,840	310	490	470	370	3,170	15,700
1989									0
1990	7,130	1,029	5,195	2,675	1,491	810		4,153	22,483
1991[c]	140		4,200						4,340
1992	26,700		12,640						39,340
1993									0
1994									0
1995		855	1,185	1,392	1,080	1,149		5,196 [d]	10,857
1996	21,660	1,211	10,290	3,062	2,805	1,944	851	5,917	47,740
1997	6,875	325	1,675	150	1,046	1,397		1,690	13,158
1998	8,445	390	3,650	1,785	2,001	523		2,770	19,564
1999	1,185	169	500	220	213	117	95	450	2,949
2000									
2001		149		372	370	418			1,309
Mean	11,777	482	4,984	1,170	1,011	833	439	2,935	23,629 [b]
%	49.8%	2.0%	21.1%	4.9%	4.3%	3.5%	1.9%	12.4%	100.0%
2002		421		597	539	62		1,027	2,646

[a] Includes all surveyed sections of Togiak River proper and tributaries to the Togiak River.
[b] Sum of means for all streams.
[c] Timing of aerial surveys did not coincide with the period of peak spawning activity, and theref counts were not included in the mean or percent.
[d] Negukthlik and Ungalikthluk Rivers combined.